RAILROAD GAZETTE

FRIDAY, NOVEMBER 13, 1903.

CONTENTS

Contributions

Strict Standards for Trainmen's Eyes.

Chicago, Ill., Nov. 4, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Oct. 2, you were kind enough to freely abstract an article which I had the honor to read before the recent meeting of the American Railway Surgeons in Chicago on Eye and Ear Requirements of Railroad Employees. The article was well abstracted, but, like all abstracts, failed to fully convey the author's meaning.

On October 30, I find an editorial commenting on my article, and while heartily approving of it in a general way, your writer takes issue with it upon some points, that are so far from my meaning that I must endeavor to correct the erroneous impressions.

You quote me as not advocating orthodox views concerning the imperative and invariable necessity for perfect color sense in all men concerned in the operation of trains, or in giving or receiving signals. If my article is read carefully it will be seen that I advocate absolutely no deviation whatever from the requirement that all trainmen, whether new or old in the service, shall possess perfect color sense. They should be instantly removed from responsible positions if such a defect is discovered. I do urge upon railroads the policy of dealing as leniently as possible with old, faithful and reliable engineers, etc. But while cautious and specific indulgence may safely be accorded such men, so far as vision and hearing are concerned, no concessions whatever should be allowed in case color blindness exists.

I ventured the opinion that as an engineer grows older in the service he becomes more valuable to the railroad. His experience ripens, . . . and what he loses in vision and hearing he makes up in other ways. You question what is meant by safe vision. Some competent authorities advocate very stringent rules, and others lean towards views of remarkable laxity. A medium conservatism seems to establish safe boundaries, and in my article I advocate the retention of faithful and reliable engineers, whose vision has not decreased below $^{20}/_{30}$ in one eye, and $^{20}/_{40}$ in the other; a standard which I am sure will be considered fair and safe to the employee, the railroad and the public, by all experienced and competent observers.

You seem to labor under the impression that I am not in favor of allowing railroad surgeons or oculists to decide whether or no an engineer shall be taken from his engine on account of physical defects. Nothing is further from my thoughts. I believe that these questions should be settled in the surgical department, and that the surgeon's opinion should be final, as he certainly is better qualified to estimate the importance of physical defects than any one else in authority. I believe that the surgeons and oculists should be given wider scope with which to improve the physical character of employees. I believe that all railroads should employ oculists on regular salaries, and that in their hands should be placed the ocular and aural welfare of railroads, both as to injuries and policy, believing that if oculists of good standing, common sense and experience be thus employed, their retention will be a continual source of gratification, profit and economy to all parties concerned.

I appreciate the many commendatory remarks to be found in the editorial, and I am gratified to realize that advanced railroad and medical views are to be found harmoniously standing side by side. . . .

FRANK ALLPORT, M.D.

Labor Union Outrages.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the issue of September 11 the address of Prof. Schmoller contains some good ideas. But the summing up covers the whole, fittingly. The age of mechanical industry has built for humanity a new and infinitely improved dwelling house. The classes are struggling for the rooms, and in the struggle they lose sight of the most important factor, education. He says that the trade unions and the right of combination must be respected, but by an improvement of the laws the darker side of unionism must be improved. No country realizes this any more than our own. Look at the long lists of union outrages the past few months. All parts of the country furnish their quota. And for all this who is responsible? The answer is not easily found. Unionism always will have to answer for a great many sins not belonging to it, for the reason that under the pressure of excitement many irresponsible persons not in any way connected with a union perform acts all of which tend to throw discredit on the union. During the progress of a strike the unionist often hurts his cause by lounging in the streets, or about his place of employment, inciting and encouraging women to clamor, and irresponsible persons to deeds of violence. I do not intend to infer that the unionist himself takes no part in the disturbance, but if he does there is a remedy that should be applied promptly, and fearlessly. Expulsion from the union should be the penalty, and any union not thus disciplining their members is not worthy of the moral support of the public. The responsibility for these outrages has not yet been fixed. I claim that the law is to blame for allowing such a state of affairs to exist.

In his Labor Day address President Roosevelt gave his views on the right of every man to work. In his decision on the Miller case he took the same stand and fearlessly kept to it regardless of political threats. This is a principle believed in by all lovers of justice, and being the attitude of the Chief Executive, it seems that it should be the keynote of all the authorities throughout this land of ours, and these outrages should be stamped out, and the persons who participate in them treated as anarchists. It is certainly anarchy when a man is not allowed to work, when, where or for what he will. I myself am a member of a labor organization and am proud of it as being one that does not say to me, you shall work so many hours per day for so much, and you shall do just so much per day. I often wonder if Sam Parks doesn't impose a fine if a member is found to be perspiring at his work? No fair-minded man will become a member of an organization that says you shall lay so many bricks per day, or you shall drive so many rivets per day, or the number of strokes of a saw shall be so many, which latter is just as reasonable as for Sam Parks to say you shall drive so many rivets per day, and no more.

I believe in the worker getting what wages he can for his work, for his brains and his hands are his capital. But I also believe in the employer who having agreed to pay so much per day getting a fair return for the wages paid. And I consider it the duty of all so paid to do all they can in reason each day. When I was an apprentice the M. M. came to me one day (I had known him about all my life) and said: "Now, Joe, when you take a job try and see how quick you can do it, and do it well. Don't do as some of my men do, try and see how long they can make a job last." His words were never forgotten, and I cannot say that following his advice was ever detrimental to my interests. The old leader of our organization, P. M. Arthur, is dead, but his work and words live: "I want to see you boys get all you can, but in the meantime be men. Do your very best, no matter what your position is or what your pay is. Do your best for your employer, and you will find this attitude is always appreciated. Do nothing that will bring discredit to our organization." Such were the teachings of the greatest labor leader of the present time.

During the progress of one of the great railroad strikes in Chicago, when rioting and other excesses were indulged in, large numbers of men were employed to protect property. Among them was a man who afterward sought admission to our organization. One hot blood among us opposed his admission, saying that during the Santa Fe strike he carried a gun against the strikers. But I am pleased to say that among us were a majority of men of common sense, and the man became one of us and made a good member.

Organization is a good thing provided the right material is in its composition, but a large percentage of common labor unions are not morally or mentally fit to be members of such a union, and it is the lack of education that makes them undesirable. The keynote of the whole fabric is education. Possibly it is to the pecuniary advantage of the walking delegate to have ignorant men compose the rank and file, but as long as ignorance predominates, labor troubles and labor union outrages will be in order until the law steps in and disbands the unions as a menace to public safety, for such they are when they are primarily responsible for rioting. Were they composed of the right material it would be their first care to see that nothing was done to throw discredit on the union either by themselves or that class who are always looking for trouble. They are still struggling for the "rooms," and will continue to do so until education reclaims them.

A LOCOMOTIVE ENGINEER.

[This law-abiding attitude is just what might be expected from a member of the Brotherhood of Locomotive Engineers, and his outspokenness is distinctly encouraging. Nearly all that he says is true, but he and his fellow members should know that it has not yet been made clear that we need "an improvement of the laws" for the prevention and punishment of violence. It is not at all true that "the law is to blame for" trade-union violence. Strict enforcement and a decent regard for the rights of the other fellow have not yet had the fair trial which they are bound to have unless civilization is a failure. The most telling retorts of union men to railroad and other companies have been the pointing out of notorious evasions and violations of law by corporations.—EDITOR.]

The Wheel-Carrying Rail Joint.

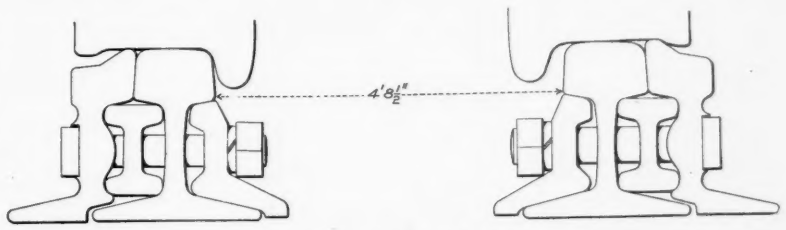
New York, Nov. 7, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the article "German High-Speed Tests," in your issue of November 6, showing a cut of the wheel carrying outer angle bar, I beg to draw attention to the fact that even with the greatly increased strength of this high speed track and the mitered rails, it has been deemed necessary to protect the rail ends.

As a wheel carrying device has been chosen for this purpose it stands to reason that practical experience has overthrown the theory formerly held by experts, that the widening of the running surface at the joint is wrong in principle! One of the experts in this country, Mr. F. C. Schmitz, also supported this theory in his article —"Some Notes on Rail Joint Fastenings"—which appeared in the *Railroad Gazette* of Oct. 12, 1900, in enumerating the conditions under which rail joints must operate by saying: (No. 5) "The joint should in no wise alter the running width of rail head." As my joint is the only wheel carrying device, which is being tested in this country by the P. R. R., his statement that such joints were a failure could only refer to the test track of this road.

In my letters appearing in your issue Oct. 19 and May 16, 1900, I took the liberty of pointing out some errors in Mr. Schmitz's statements, and I regret that he discontinued a discussion thus entered into, which might possibly have made clear many points on a subject of general interest and great importance.



Wheel-Carrying Rail Joint.

On account of my leaving for Europe in the spring of 1901, I was unable to personally follow these matters. In September of that year test tracks of the Western Division of the P. R. R. were examined by my representative with the kind permission and assistance of the officials. This tour of inspection established the fact that a majority of the engineers of the P. R. R. were satisfied that the Barschall joint would be superior to any other joint they had ever tested (and they have tried them all) if the one and only objection—that of the false flange of wheels striking on the widened running surface of the auxiliary rail—could be overcome.

Mr. Schmitz unfortunately most abruptly finished a discussion carried on in the *Gazette*, in his letter published Nov. 2, 1900, with the statements: "I reiterate my statements that there is but one condition of wheel and rail at which the joint does its work perfectly, and that no joint should alter the running width of rail head. Unfortunately I am not at liberty to give some figures I have, etc. . . . I can only say they failed."

In June, 1903, I requested the managements of the P. R. R.—both Eastern and Western Divisions—to let me have the results of their five years tests. The only reply received came from Philadelphia, as follows: "From such information as I have before me on the result of this test, I am not able to convince myself that the Barschall joint is any better (if as good) than two other joints that we have experimentally tried, and our people do not feel that the rolled form, for which you desire a trial, would materially improve matters." . . .

Shortly after my return to this country in October I

again repeated my request for detail of result of test, and again the only reply came from Philadelphia saying: "I have your letter of the 20th inst. in reference to your rail joint, but cannot add anything further to my previous answer to you on the subject. Your joint, although a very strong one, would not be at all adapted for our requirements."

It is not clear why or how the "requirements" of the P. R. R. should differ from those of other roads! The "feeling" that the improved, rolled shape would not "materially improve matters," is based on results with the wrong pattern of my joint which the P. R. R. has been testing. These joints were made by hand out of old rails the material of which was too soft, and could not be made to sit close enough to the head of the rail, thus widening the running surface too much.

The theory against the widening of the running surface at the joint could only be based on unfavorable results of former years with joints not answering the purpose. In the rolled form of my joint, made to specifications and requirements to do justice to the invention, this widening at the joint is so reduced that the false flanges will clear the outer rail, as proven in Europe. Suppositions are not reasons; practical experience alone proves facts. It cannot possibly be denied that by reducing the width of the joints now in use the one and only objection must be overcome.

If my joint had in fact proven a "failure," as claimed by Mr. Schmitz in 1900, it would long ago have been thrown out, as were others tested by the P. R. R., that were found unsatisfactory. After five years these same joints though of inferior shape, material, etc., preventing the full efficiency, are still in track, and "doing pretty well."

The drawing herewith at once shows the superiority of the shape of the rolled outer rail, and permits the joint to perform its functions on the principle designed and as intended by the inventor. Notwithstanding this superior shape of head, such an outer rail, if supported on the foot of the main rail, will never answer the purpose on account of its rigid fastening to the latter.

Mr. Schmitz says (page 686, 1900): "As is shown in the sketch, there is but one condition of wheel and rail under which the joint is efficient. A new wheel rides the main rail without touching the auxiliary, while with a worn driver the reverse is true." And on page 713: "The point at which a wheel reaches the full cross-section of the auxiliary rail, and therefore comes to a full bearing on it, is over a tie. Consequently both main and auxiliary rail must be on the same foundation and be on the same level."

I take the liberty of contradicting Mr. Schmitz in stating that the full running width of the rolled outer rail of the Barschall joint begins and ends at the points where it is suspended. Smooth riding over the tie is secured by the combination of the transverse and longitudinal slopes, while between the ties it is the independent elasticity of the two suspended bearers, which equalizes the uneven shapes of tires, as well as the difference in level of the surfaces of the two bearers. Under the load they are both brought to bear. New wheels deflect the main rail until the outer rail is brought to bear. Worn tires deflect the outer rail until the main rail is brought to bear. If, before applying the outer rail, the ends are permanently deflected beyond the degree of this independent elasticity, the outer rail will alone carry the load over the joint, protecting the ends until the wear of the other parts of the rail bring them to bear again.

This is one of the strongest features of the joint, because of the immense, immediate savings that can be made by keeping rails with battered or permanently deflected ends in track until worn out in their entire length. This statement is no mere theory, but a fact proven by practical experience, showing smooth riding and considerable reduction of labor in maintenance of track. It is natural that outer rails and rail must be of the same quality of steel in order to secure equal wear of both.

As to lateral strength of resistance it is obvious that the two independent bearers, supported one against the other by the filler, must be stronger than with rails jointed with angle bars supported on one and the same foot.

Mr. Schmitz in his paper in the *Railroad Gazette* of Oct. 12, 1900, says: "We find the following conditions under which all rail joints must operate." He specifies nine conditions under which a perfect joint must operate. As far back as 1900 Mr. Schmitz concedes that my joint operates under eight of these nine conditions, and finds it only failing under condition No. 5. The joint should in no wise alter the running width of rail head.

Now, since this theory has been proven wrong by the actual practical experience of years, perhaps Mr. Schmitz will be kind enough to-day to concede that my joint answers all of the necessary conditions that could be required of an "ideal rail joint." Fulfilling all desirable or necessary conditions what else is there that could be asked of a rail joint?

I close with the statement that the joints used in the tracks of the P. R. R. and reported as "not answering the requirements of this road," do not even answer the requirements of the invention.

MAX BARSCHALL.

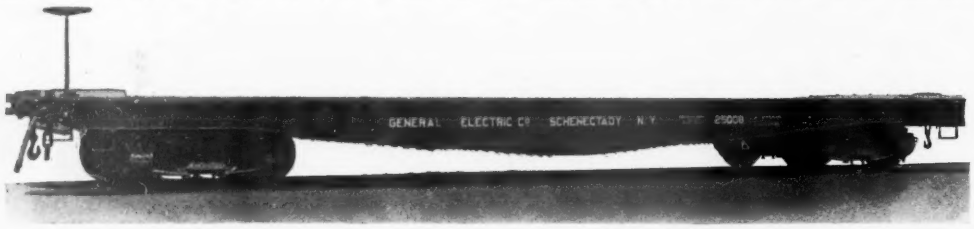


Fig. 1.—Flat Car for The General Electric Co. Capacity 120,000 Lbs.

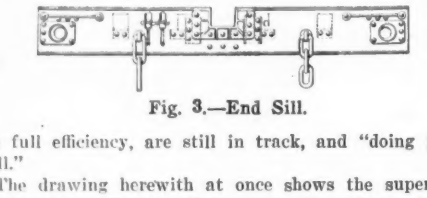


Fig. 3.—End Sill.

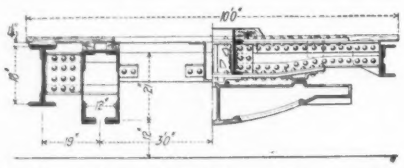
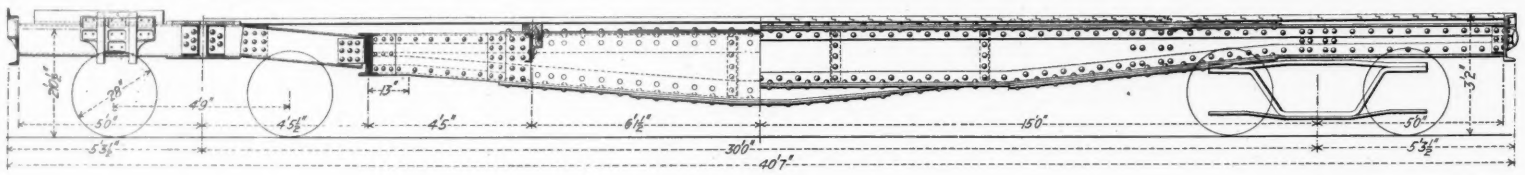


Fig. 4.—Sections at Bolster and Center of Car.

A Flat Car for Heavy Castings.

The American Car & Foundry Co. has built for the General Electric Co. two steel underframe flat cars at its Berwick shops. These cars, which are shown in the accompanying engravings, are the largest capacity eight-wheel cars ever built, having a stenciled capacity of 120,000 lbs. and designed for 10 per cent. overload. Their weight is 47,500 lbs., giving a total weight when fully loaded of 180,000 lbs., carried on four axles. They were designed especially for carrying large field rings, armatures and other heavy pieces of electrical machinery and for this reason the usual practice in flat car construction could not be followed. The cars are 40 ft. 7 in. long over end sills, 10 ft. wide over floor and only 3 ft. 2 in. from the top of rail to top of floor, 8 in. less than the usual height of floor. In the center of the floor between bolsters is an open well, 5 ft. wide and 11 ft. 9 in. long,

Fig. 5.—Removable Door for Well.



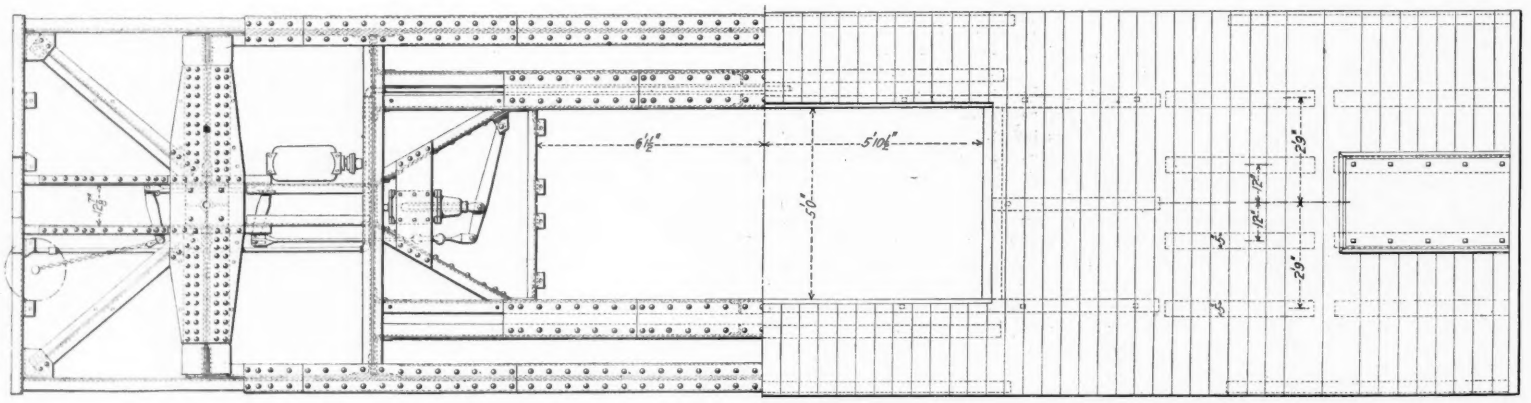


Fig. 2.—Plan and Elevation of 120,000 lb. Flat Car for The General Electric Co.

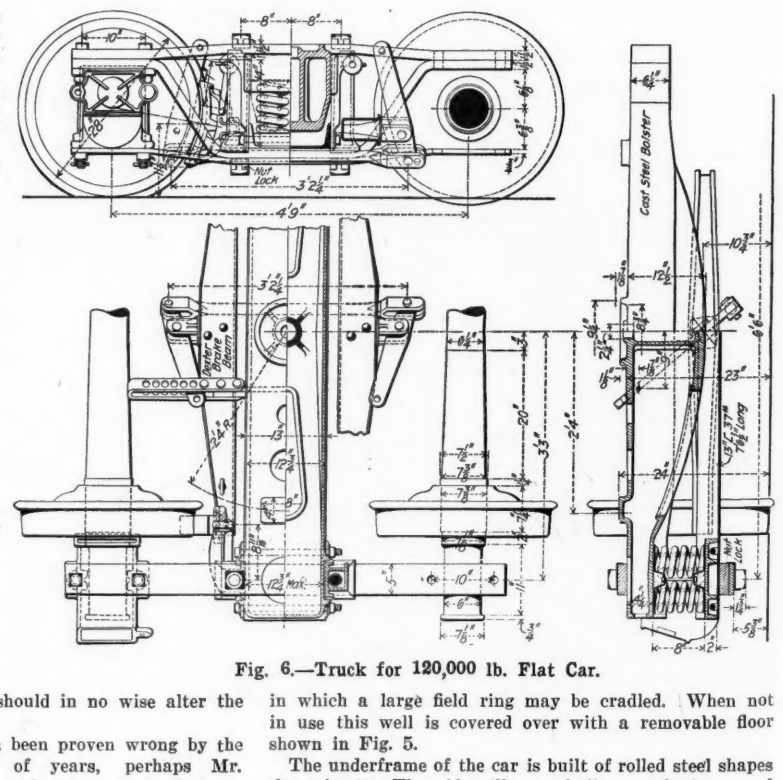


Fig. 6.—Truck for 120,000 lb. Flat Car.

in which a large field ring may be cradled. When not in use this well is covered over with a removable floor shown in Fig. 5.

The underframe of the car is built of rolled steel shapes throughout. The side sills are built up of plates and angles forming a deep plate girder continuous over the bolsters from end sill to end sill. Between the bolsters

the sill has an I section 18 in. deep, but between the bolsters and end sills the inside angles at the top and bottom are omitted, giving the sill a channel section, and the web is cut down to give a depth of 10 in. The bolsters are built up of plates and angles and are very strong. Three thicknesses of plate are used in the web and they are riveted to the side sills with heavy angles. The draft sills are channels and extend through the bolster. Just back of that member they are spliced to two short channels connecting the bolster to the cross-tie. These spliced pieces extend downward to accommodate the difference in height of the bolster and cross-tie and are placed back to back with the draft sills to do away with splice plates, the rivets passing through the webs of both channels.

The cross-ties are placed 4 ft. 5½ in. from the bolsters and are of I section, built up with four angles and a plate web. Between these cross-ties and just inside the side sills are the intermediate sills on which most of the load rests when placed in the well. These are box girders 12 in. wide and 21 in. deep at the center with the bottom cover plate omitted. A light channel riveted between them supports the floor next the well opening, and at each end there are two diagonal braces from which the brake cylinder is hung.

Because of the limited space under the car it was necessary to put in a seperate brake cylinder and reservoir at each end of the car. The arrangement of the cylinder and levers for one end is shown on the general plan. In order to preserve the standard height of drawbar of 34½ in. with the low floor, the cheek plates for the draft gear were raised above the level of the floor and a hood built over the gear as shown on the plan.

The floor is wood, matched and nailed to nailing strips bolted to the underframe. The removable door for the well is trussed underneath, using an I-beam for the strut.

The most interesting feature of these cars is the truck. Every part of it has been designed with ample strength to carry the heavy load imposed. The journals are 6 in. x 11 in. and the axles are 6¼ in. in diameter at the center. The bolster is a special design of cast steel made by the American Steel Foundries. Top and bottom arch bars are made of bars 5 in. x 1½ in. The journal boxes were made from special patterns and conform in general proportions to the M. C. B. standards for the smaller sizes. Cast iron wheels, 28 in. in diameter, are put under the car, the small diameter being used to get the low height of floor specified. They were made by the builders. Other special equipment includes, Hennessey friction draft gear, Dexter brake-beams and Westinghouse brakes.

We are indebted to Mr. John McE. Ames, Mechanical Engineer of the American Car & Foundry Co., for the drawings.

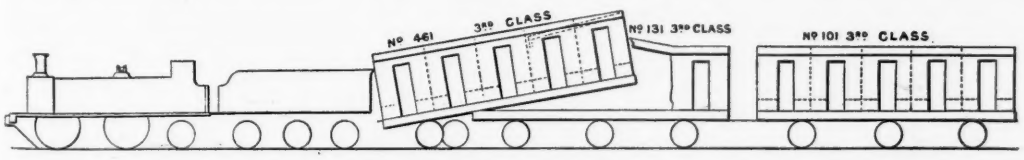
The Glasgow Train Disaster.

Col. H. A. Yorke, Inspector for the Board of Trade, has reported the facts and his conclusions on the most serious train accident which has occurred in Great Britain in recent years. At St. Enoch's station, Glasgow, on July 27, an entering train came into violent collision with the buffer stops. The shock was such as to throw the rear ends of the carriages near the front of the train upwards, thus permitting the leading end of the underframe of the second coach to get below the rear end of the frame of the first coach, as shown in the accompanying diagram, the result being that, as the second coach was pressed forward by the momentum of the train behind it, the body of it was completely telescoped. Seventeen passengers were killed and 64 were more or less seriously injured. The train, behind the engine and tender, consisted of 10 six-wheeled cars and three eight-wheeled cars, weighing 260.7 long tons (584,000 lbs.). The buffer stop was damaged, but held its own, and the cars behind Nos. 461 and 131 were but slightly injured. The momentum of the train behind the tender was substantially all absorbed by the telescoping.

St. Enoch station formerly had six platforms. The capacity has recently been doubled, and the added platforms are shorter than the old ones. No. 8, on which them to stop the train at the proper place by the application of the ordinary hand-brake only, and guards must watch the speed of the trains and assist the engine-drivers by the use of the hand-brake when necessary."

Col. Yorke says: "The station is admittedly a bad one to enter owing to the curve, and it is difficult for a driver to see the end of No. 8 platform until he is halfway along it, so that all times it is necessary to be careful. It is not improbable that if the brake on the engine had been of the rapid acting description the speed might have been much reduced before the collision occurred. But this pattern of brake is hardly known in the United Kingdom, and it was Northcote's (the driver's) business to regulate the speed according to the brake power available, and to the rules." . . .

"Suggestions have been made that in order to guard against the consequences of collisions of this nature, one, and even two, vans or empty coaches should be placed in front of every passenger train. On long distance trains it usually happens that a luggage van is so placed, and on local trains there is generally a compartment for a guard and a small amount of luggage at each end of the train. Some companies, moreover, make it a practice on all trains to lock up the two front compartments of the carriage next to the engine, when this does not happen to be a van, and no doubt some measure of safety is thus provided, though in this instance no benefit would have been derived from either of such measures. But it does not seem to me practicable to call upon railroad companies to provide on every train a van or an empty carriage, still less two empty carriages, next to the engine. On workmen's trains, for instance, or suburban trains, or excursion trains, upon which little or no luggage is carried, and in which seating accommodation is generally insufficient, it would be impossible to attempt it. And when the total number of trains of all sorts that are in daily service is borne in mind, it will be apparent that a large number of empty vehicles would have to be hauled about the country, if any regulation, such as that suggested, were made obligatory. Not only would this necessitate a large and unproductive increase in the rolling stock of all railroads, but it would also entail a general increase in the length of platforms, and seriously affect the working expenses. Moreover, end-on collisions are



The Glasgow Train Disaster.

the wrecked train entered, is 617 ft. long, while the old platforms are from about 800 ft. to 1,100 ft. The track for No. 8 is on a curve of 600 ft. radius. The bumper post was first seen by the driver and fireman at a distance of 135 ft., and it was then that they got busy with the automatic vacuum brake, the steam sanding apparatus, the engine reverse and the hand brakes. At this point the trainmen estimated the speed at eight miles per hour, but other observers caused Col. Yorke to believe that the speed was from 12 to 15 miles per hour. At some distance from the entrance to the station there is a conspicuous speed board with "10 miles an hour" marked on it.

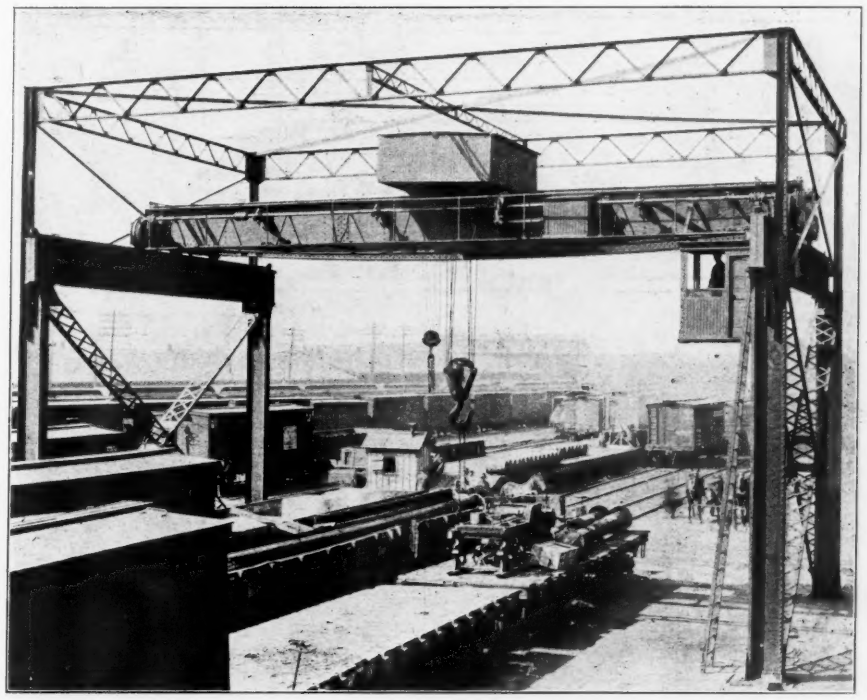
In the general regulations for working the vacuum automatic brake, Rule 5 contains the following: "Engine-drivers must enter such stations (terminals), or a dead-end bay at any station, at such a speed as to enable at least as frequent as head-on collisions, and if the precaution is to be carried out logically, the same measures would be as necessary at the end of every train as at the head. Greater security is in my opinion to be obtained by careful working, by strict enforcement of rules, by good discipline, and by improved, i.e., rapid acting, brakes."

"In conclusion I would make the suggestion that the time has come for a reconsideration of the brake question in this country. I do not now refer to the dual system which unfortunately exists, some companies having the vacuum and some the Westinghouse, though this is all-important and will have to be faced if freight trains are to be fitted with continuous brakes. But I refer to the fact that the brakes employed on the passenger rolling stock in the United Kingdom, whether they belong to the Vacuum class or to the Westinghouse class, are not of the most modern description. Since automatic continuous brakes were first adopted in this country, improvements have been made in them whereby their rapidity of action has been largely increased, and the distance, or time, within which a train can be stopped has been proportionately reduced. Both the Vacuum Brake Company and the Westinghouse Brake Company have for some years past been able to supply quick-acting brakes, the advantage of which in times of emergency cannot be gainsaid. These improvements, though adopted abroad, seem to have been ignored in the United Kingdom, where, so far as I know, only one railroad company has done anything, even experimentally, towards fitting its passenger stock with a quick-acting pattern of brake. The speed and weight of trains are ever on the increase, and the rapidity with which brakes can be brought into operation becomes daily of more importance. It is therefore surprising to find that the modern improvements in brakes have not been adopted in the United Kingdom, and that English rolling stock is still being fitted with the same patterns of brakes as were introduced 25 years ago."

These remarkable statements by Col. Yorke are referred to in the editorial page.

Niles Crane for Handling Freight in Yards.

The illustration shows a 40-ton Niles overhead electric traveling crane installed in the Buffalo yards of the Buffalo & Allegheny Valley division of the Pennsylvania.



Niles 40-Ton Electric Crane in the Buffalo Yards of the Pennsylvania Railroad.

It is for handling heavy and bulky freight and spans three tracks, the distance between runways being 48 ft., leaving a wide passageway for teams and trucks on one side of each string of cars served. The runway is made of structural steel and is 40 ft. long.

In addition to the main hook, a quick-running auxiliary hook of five tons capacity is provided for the rapid and efficient handling of light loads, which performs by far the greater part of the service of the crane. The bridge consists of two heavy curved girders of box section. It is driven longitudinally on the runway by a motor on the front girder in the illustration, which is geared to the truck wheels on either side. The motion is controlled by a foot-brake in the operator's cage which acts directly upon the armature shaft of the motor. A foot bridge is provided the entire length of the span, with the customary guard rail.

The bridge trucks are a built-up type, securely and rigidly fastened to the girders. They are provided with heavy cast-steel, double-flanged wheels with treads accurately finished to uniform diameter. The trolley is the standard type used on overhead cranes, consisting of heavy side frames securely bolted together and kept in true alinement by a separator. All the gearing is cut from the solid, and runs encased in oil, giving the entire mechanism an unusually high mechanical efficiency. Both hoists are provided with mechanical and electric brakes, and also with circuit-breakers and limit switches to prevent overwinding and consequent damage to the crane or its load. The trolley, operator's cage, and bridge-drive motor are of the inclosed type, affording suitable protection from the weather. The runway is of substantial construction. It consists of four built-up columns carrying runways of riveted plate and channel construction, laterally braced by overhead struts and chords of lattice construction.

An equipment of this character has a much greater capacity than the average pillar or swinging crane. If at any time it is desired to serve increased territory the length of runway may readily be increased. This crane is notable because of the extra height of lift, which

enables the loaded hook to clear the top of box cars or other obstructions while performing the functions of its regular service of loading and unloading.

The apparatus was made and erected by the Crane Department of the Niles-Bement-Pond Company, Philadelphia.

Tandem-Compound Consolidations for the Colorado & Southern.

The compound consolidation locomotives illustrated herewith were built for the Colorado & Southern by the Rhode Island Works of the American Locomotive Company. They are the Schenectady four-cylinder tandem design, the cylinder dimensions being 16 in. and 28 in. diameter by 32 in. stroke. The drivers are 57 in. in diameter and the relation between piston stroke and driver diameter should make these locomotives good grade-climbers. They weigh 201,700 lbs., 178,000 lbs., or 88 per cent., of which is tractive weight. The cylinder tractive effort is 43,200 lbs., following being some of the typical ratios based thereon:

Weight on drivers to tractive effort	4.12
Tractive effort to heating surface	14.56
Total weight to heating surface	68.00
Htg. surface to volume of high-pressure cylinders	398.40
Steaming capacity*	.213

The fire-box has sloping side sheets, the water space being 4 in. at the bottom and increasing to 6¼ in. at the top. The back space also increases from 4 in. to 6 in. The fire-box has a brick arch supported on water tubes which add 19½ sq. ft. to the fire-box heating surface. The percentage of total heating surface contained in the fire-box is 6.

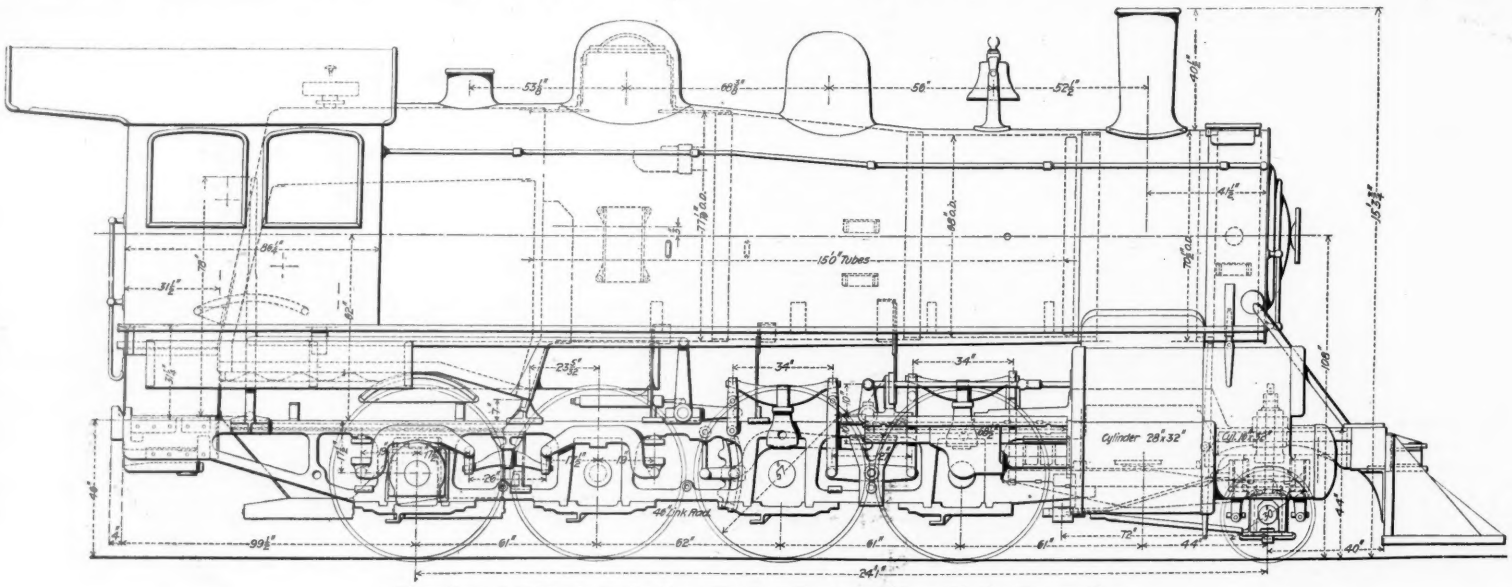
The tender frame is 10-in. steel channels, on Diamond Player cast-steel body bolsters and trucks. The tender capacity is 8,000 gals. of water and 10 tons of coal. The locomotive has a 11-in. left-hand air pump and a 10-in. tender brake cylinder.

The following completes the list of dimensions:

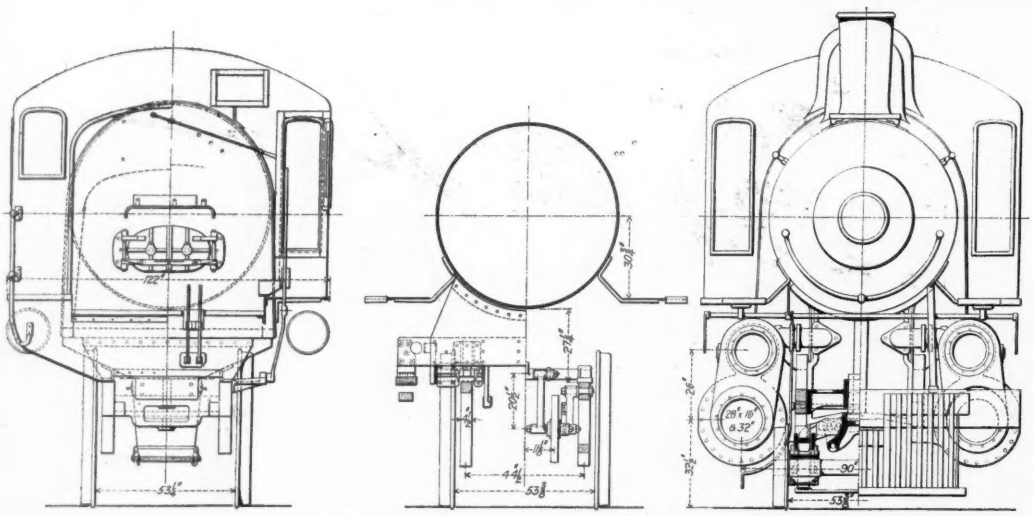
Fuel	Bituminous coal
Weight engine and tender in working order	344,127 lbs.
Wheel-base, driving	15 ft. 4 in.
Wheel-base, rigid	15 ft. 4 in.
Wheel-base, total	24 ft. 1 in.
Wheel-base, total, engine and tender	53 ft. 9½ in.
Horizontal thickness of piston	5½ in.
Diameter of piston rod	H. P., 3 in.; L. P., 4 in.
Kind of piston packing	Cast-iron spring ring
Driving box material	Cast steel
Diameter and length of driving journals:	Main, 9½ in. x 12 in.; front, int. and back, 9 in. x 12 in.
Diam. and length of main crank-pin journals:	6¾ in. dia. x 6¾ in.
Section of rods	Main, I section; side, rectangular
Engine truck, kind	2-wheel, swing motion
Diameter of engine truck wheels	30 in.
Kind of engine truck wheels	Paige spoke center

Boiler.

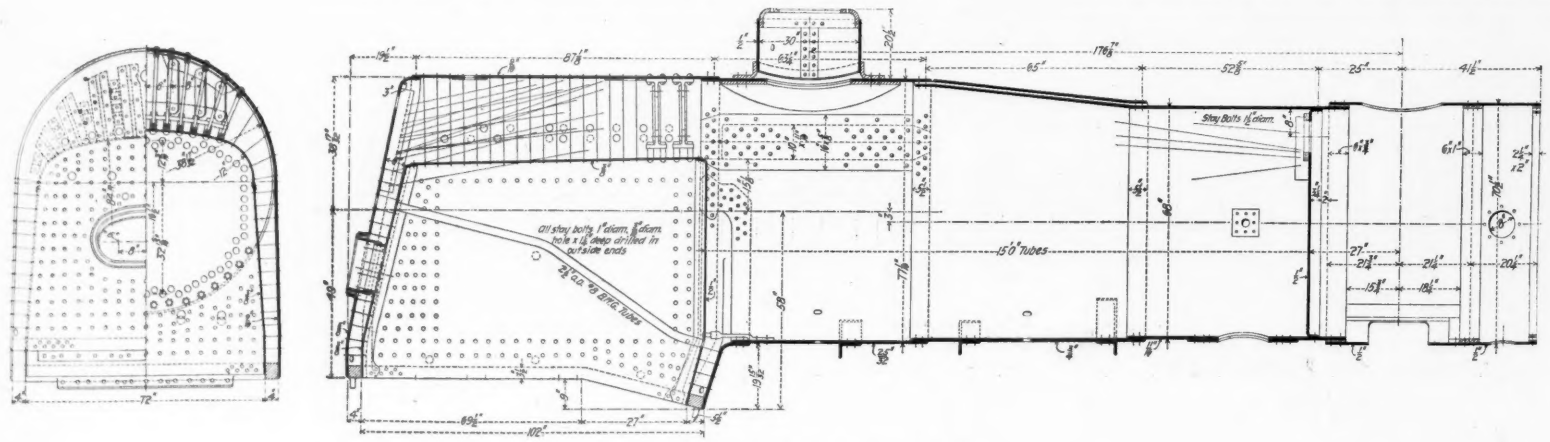
Style	Extended wagon-top, wide fire-box
Outside diameter of first ring	68 in.
Working pressure	210 lbs.
Thickness of plates in barrel and outside of fire-box:	11/16 in., ¾ in., 25/32 in., 9/16 in.
Horizontal seams	Butt joint, sextuple riveted
Circumferential seams	Double riveted, except back head
Fire-box, length	101⅛ in.
Fire-box, width	71¼ in.
Fire-box, depth	Front, 73⅛ in.; back, 62¾ in.
Fire-box, material	Carbon steel
Fire-box, thickness:	Sides, ⅜ in.; back, ⅜ in.; crown, ⅜ in.; tube sheet, ½ in.
Fire-box, water space:	4½ in. to 4¾ in. front; 4 in. to 6¼ in. sides; 4 in. to 6 in. back.
Fire-box, crown staying	1⅛ in.
Fire-box, stay-bolts	1 in.
Tubes, number	355
Tubes, diameter	2 in.
Tubes, length over tube sheets	15 ft.
Fire brick supported on	Arch tubes
Heating surface, tubes	2787.95 sq. ft.
Heating surface, water tubes	19.5 sq. ft.
Heating surface, fire-box	158.8 sq. ft.
Heating surface, total	2966.25 sq. ft.
Grate surface	50 sq. ft.
Exhaust pipes	Single
Exhaust nozzles	5¼ in., 5½ in. and 5¾ in. diam.
Smokestack, inside diameter	16 in.
Smokestack, top above rail	15 ft. 4 in.
Size of steam ports:	L. P., 30½ in. x 2⅛ in.; H. P., 30½ in. x 1⅞ in.
Size of exhaust ports:	L. P., 30½ in. x 3 in.; H. P., 30½ in. x 3 in.
Size of bridges	2⅞ in.
Kind of valves	Piston, Schenectady style
Greatest travel of valves	6 in.
Outside lap of valves	⅞ in.
Inside lap of valves	H. P., line in line; L. P., ¼ in.
Lead of valves in full gear	0 in.
Material of driving wheel, centers	Cast steel
Thickness of tire	3½ in.
Tire held by	Shrinkage



Elevation of Colorado & Southern Tandem-Compound Consolidation Locomotive.



Sections of Colorado & Southern Locomotive.



Boiler of Colorado & Southern Locomotive.

*Railroad Gazette, June 19, 1903, p. 441.

History of the Grand Central Terminal, New York City.

BY WILLIAM STANTON ROOT.

In 1831, the population of the city of New York was estimated at 202,000 souls. St. John's Park, bounded by Hudson, Varick, Laight and Beach streets, bore the same relation to the city at that time which Central Park does to-day; its beautiful trees and shrubbery were the pride of all New Yorkers, while facing the park and in the adjacent streets were the homes of the most opulent and aristocratic families of the metropolis. The business section of the city did not extend above Wall street; City Hall Park and Bowling Green were the favorite promenading places, while the section north of 34th street was about as remote from the populous districts as Washington Heights above 183d street is to-day. The period was one of great commercial activity and general prosperity. A large fleet of vessels, flying the American flag,

left the port every week, carrying our products to all parts of the globe; the Erie Canal, opened in 1826, connecting the Great Lakes and the West with tide-water, had been a success far beyond the most sanguine dreams of its projectors; it had built up thriving villages along its route which have since become the most prosperous cities in the country; it had given to the city of New York a commercial impetus which placed it far in the lead of all the other cities of the country, and which has continued unabated to this day. The merchants of Baltimore, alarmed at New York's great lead, had planned the construction of a horse railroad from Baltimore to the Ohio River to obtain some of the western trade which the Erie canal had diverted from their markets; and, on July 4, 1828, in laying the corner stone of the Baltimore & Ohio Railroad, the venerable Charles Carrol, of Carrollton, had said: "I consider this among the most important acts of my life, second only to that of signing the Declaration of Independence, if second only to that." While this railroad was the first long-distance railroad projected in the United States, to New York belongs the honor of having incorporated and constructed the first passenger steam railroad in America, the pioneer of the modern steam railroad and of the New York Central system.

On April 17, 1826, a charter was granted to the Mohawk & Hudson Railroad to construct a line from Schenectady to Albany.

In 1830, the late John B. Jervis, M. Am. Soc. C. E., who had obtained a wide reputation as engineer for the Delaware & Hudson Canal Company, was appointed chief engineer of the Mohawk & Hudson. Ground was broken on July 29 of the same year, and the entire line between the two cities completed by July 25, 1831. This road was operated by means of inclined planes, with nearly straight, level track between them. The theory then held was that a locomotive could not be built that could round a curve such as are now in existence on every railroad in the country. The ascent from the level of the Hudson River was one foot in 18 to a point 185 ft. above the level of the river. There was a curve of 1,000 ft. radius at the eastern and one of 23,000 ft. radius at the western end, with one of 1,000 ft. radius on the summit. This route rendered necessary heavy embankments and deep cuttings. The descent from the summit to Schenectady was 335 ft., the inclined plane at that point overcoming a height of 115 ft. The roadbed was of solid masonry and it was estimated that one mile of this road cost more than the entire 23 miles of the Baltimore & Ohio, which had been constructed at that time. Two locomotives had been purchased by the company, the "De Witt Clinton" and "Robert Fulton." On Sept. 25, 1831, the "De Witt Clinton" made the trip between Albany and Schenectady, a distance of 17 miles, in 38 minutes. Inasmuch as the regular running time between the two places for the average express train of to-day is only 30 minutes, it will be readily seen that the success of the steam railroad was then and there demonstrated beyond a question of a doubt. The remarkable performances of these early steam locomotives, and the general success of the "experiment," as it was called, electrified the country, and companies were organized in all sections to build railroads. The application of steam to the operation of railroads revolutionized the then existing methods of travel and transportation, and may be compared to the successful use of electricity in solving some of the difficult problems of to-day.

The fertile and prosperous farming district, "The Garden of New York," between Albany and Buffalo, offered a most promising field for railroad enterprises. The Mohawk near Little Falls flowed through practically the only break in the Allegheny Mountains, and in 1842 the last link in the series of railroads had been built connecting Albany with Utica, Syracuse, Auburn, Geneva, Rochester and Buffalo. The year before, the Western Railroad Corporation of Massachusetts had extended and opened its line from Worcester to the New York State Line, connecting there with the Albany & Stockbridge Railroad. Thus we see that as early as 1842 there was in operation a complete line of railroads between Boston and the lakes. This line added much to the prosperity of Boston. There were several months of each year that the Hudson was closed, isolating New York City from the great region to the north and west, and the question that was agitating the minds of the merchants of the city was how to reach Albany by rail, and form a connection with the great Boston and Buffalo line.

During the railroad fever which followed the successful operation of the Mohawk & Hudson, the New York & Harlem Railroad was incorporated to construct a line from 23d street to the Harlem River. The next year permission was granted to extend the line south to 14th street, but the use of steam south of 14th street was prohibited. In 1840, the road had been extended north to Fordham and south to the City Hall, and was gradually being extended further north, but Albany was still far from being reached. At this time the Erie Railroad had been built as far west as Port Jervis, with its eastern terminus at Piermont, opposite Irvington, on the Hudson River. It was referred to in jest as a "railroad starting from nowhere and running to no place."

In 1840, President Samuel H. Brooks, of the Harlem, had a survey and estimate made for a branch road to be constructed from a point on the Harlem to a point on the Hudson opposite Piermont, and made a proposition to the directors of the Erie offering Erie a direct connection with the line running to the City Hall in New York, provided the Erie would bear two-thirds of the cost of construction of the branch line and lease the same to the Harlem on a 7 per cent. basis. The cost of this branch was estimated at $132,000; it would have given the Erie a direct rail connection with the very heart of New York, and would have brought the Harlem within 76 miles of Albany; but there is nothing on record to show that the directors of the Erie ever gave the matter any consideration whatever. E. H. Mott, in his monumental work, "Between the Ocean and the Lakes," exclaims: "The fatal mistake that made possible all of Erie's subsequent woes! But for that mistake there would be no Vanderbilt Kingdom, and the history of Wall street and of railroads in this country would have been entirely different. All of the present great terminal possessions of the Vanderbilt system at 42d street in New York City would have been Erie's by the nod of the head and the outlay of $90,000!"

Among the many schemes to reach Albany was one of constructing a line along the Hudson River; this scheme had been carefully considered by a commission of experts, and had been pronounced impracticable on account of the heavy construction necessary. In 1846, however, Mr. J. B. Jervis, who had built the Mohawk & Hudson, made a report in which he pronounced the project not only a feasible but a practicable one, and work was immediately commenced. In 1849, the road was completed from 30th street, New York, to Peekskill; in 1850 to Poughkeepsie, and on Oct. 3, 1851, the entire road from Chambers street, New York City, to East Albany, a distance of 144 miles, was opened with imposing ceremonies. The great problem of reaching the North and West had been successfully solved, and the time between New York and Albany reduced from ten to four hours, with communication open all the year around.

The construction of the Hudson River Railroad was one of the notable engineering feats of the century; its total cost was $11,328,990; or $45,316 per single track mile. The effect of the building of this road upon the commercial and industrial prosperity of New York City cannot be estimated. In 20 years the population of the city had more than doubled, it being estimated that in 1851, 515,547 persons dwelt south of 42nd street. The unprecedented commercial development of the city was gradually transforming the old residence districts into business centers, and many people were building new homes in Harlem and in the broad avenues and side streets in the northern section of the city, which had for half a century been laid out but had been considered inaccessible until the construction of the Hudson River and Harlem Railroads. Indeed, there were many places in New Jersey and Connecticut that were nearer to the business center of New York than a large part of Manhattan Island. The transportation facilities of the city at that time being observed from the following table of railroads having terminals in and about New York in 1851:

Railroad.	From—	To—	Present ownership.	Terminal.
Hudson River	New York	East Albany	N. Y. C. & H. R.	Chambers street.
New York & Harlem	New York	Dover Plains	N. Y. C. & H. R.	City Hall.
N. Y. & New Haven	New York	New Haven	N. Y., N. H. & H.	Canal and Broadway.
Housatonic	Bridgeport	State Line	N. Y., N. H. & H.	Canal and Broadway.
New York & Erie	Piermont	Dunkirk	Erie	Foot of Duane street.
Paterson & Hudson	Jersey City	Paterson	Erie	Foot of Duane street.
Ramapo & Paterson	Jersey City	Sufferns	Erie	Foot of Duane street.
Long Island	Brooklyn	Greenport	P. R. R.	Atlantic avenue.
Camden & Amboy	South Amboy	Camden	P. R. R.	7 Battery Place.
New Jersey R. R.	Jersey City	New Brunswick	P. R. R.	Foot of Cortlandt.
C. R. R. of N. J.	Elizabethport	White House	C. R. R. of N. J.	Pier 1, North River.
Morris & Essex	Hoboken	Phillipsburg	D., L. & W. R. R.	Jersey City.

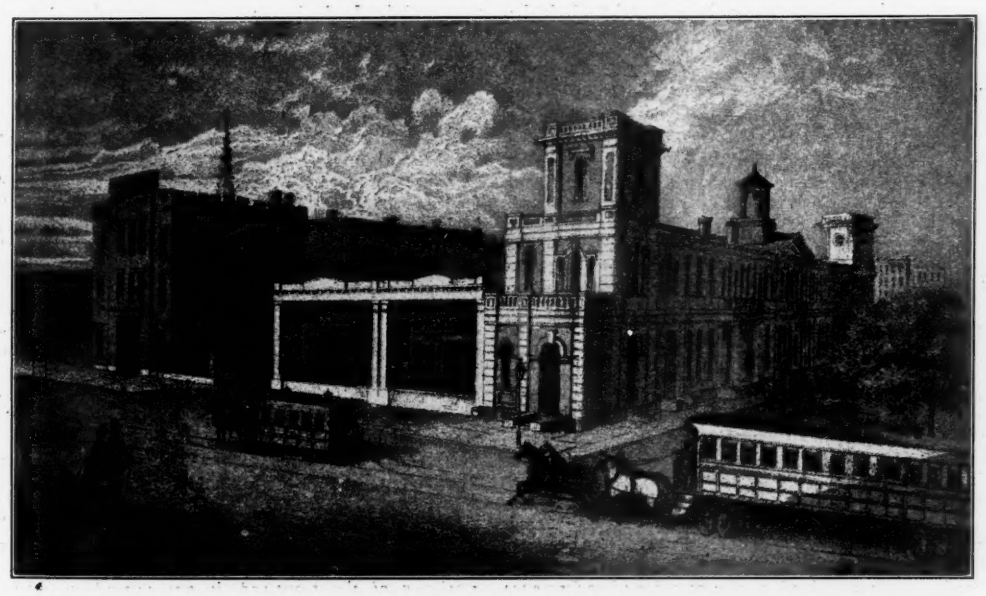
The promoters and builders of the early railroads, as well as the city authorities, saw the great danger which might result from allowing the steam railroads to run their trains at grade into the crowded sections of the city; this difficulty was overcome by the use of horses, and in our day, by the use of electricity.

The New York & Harlem and the New York & New Haven Railroads, the latter using the tracks of the Harlem south of Woodlawn, undertook to land their passengers in the heart of the city at the Astor House, opposite City Hall Park. The through and local trains of these railroads were operated by steam to 32nd street and Park avenue. At this place the locomotives were detached and six horses hitched to each of the cars, and the latter drawn south to the City Hall. Stops were made at important points, such as 23d street, 14th street, Eighth street, Bowery and Broome street, Canal and Centre streets and the City Hall. In 1851 most of the New Haven passengers were landed at their terminal; in Canal street, near Broadway.

The terminal station of the Hudson River Railroad was at this time on the northwest corner of Warren street and College place. The locomotives were detached at 30th street, the cars being taken south through the city, each drawn by six horses, making stops at 23d, 14th, Christopher, Canal and West streets, and then at the terminal depot.

The rapid growth of population and the movement of the residential districts to the north made imperative the demand for suitable terminal facilities at central points for the handling not only of passenger travel, but for the handling of the great amount of baggage, express and mail matter which naturally found its way to a large city, and in 1860 we find the Harlem and New Haven Railroads centering their terminal business at 26th street and Park avenue, on the present site of Madison Square Garden. The Hudson River Railroad established its terminal at 30th street and 10th avenue, and it was to this station that Abraham Lincoln came on his way to be inaugurated President of the United States, in 1861.

In 1863, Cornelius Vanderbilt, who had amassed an immense fortune in the operation of steamship and ferry lines, turned his attention to railroads, and purchased a controlling interest in the New York & Harlem Railroad. The stock of this company had long been a drug on the market, and that it would ever be the foundation of a great railroad system, never entered the minds of ordinary citizens. The charter of this company permitted it to build a horse line down Broadway as well as in Fourth avenue, and the proposition of Vanderbilt to take advantage of this right, as well as the great prestige of his name, had raised the value of the stock from $10 to par. In 1864 Vanderbilt had also obtained a controlling interest in the Hudson River Railroad, and had a bill introduced in the Legislature authorizing the consolidation of the two lines. Many of the legislators entered into an agreement with stock speculators to defeat the bill, and force down the price of Harlem stock, which the rumors of consolidation with the Hudson River had raised from $75 to $150, and agreed to deliver in the future 27,000 more shares than the entire stock of the road, but Vanderbilt and his associates bought up all that was offered for sale, thus obtaining the famous "Harlem Corner," forcing the price up to $285 per share. It was not alone in Wall street that he displayed his most remarkable genius; he foresaw the great possibilities of a great trunk line entering the heart of the city, and immediately began to purchase New York Central,



New York & Harlem Passenger Station, 4th Avenue and 27th Street in 1860.

and by 1867 he had obtained a controlling interest in that road, and was elected president of the corporation. By act of Nov. 1, 1869, the New York Central and the Hudson River Railroads were consolidated, and then were projected those vast improvements which were to revolutionize the transportation facilities in the city of New York, and have a far-reaching effect upon the commercial development of the United States. These improvements were to include the construction of a great passenger terminal at Fourth avenue and 42nd street, now "the center of the hotel, residence, club and theater district of the City of New York," which was to be unsurpassed by any in the world; the four-tracking of the road between Albany and Buffalo, the construction of the Spuyten Duyvil & Port Morris Railroad to bring the trains of the consolidated railroad into the Grand Central Station; and the equipment of the road with latest and most improved rolling stock which could then be built.

The first stone in the construction of the Grand Central Station was laid Sept. 15, 1869, and the first train left the train-shed on Oct. 7, 1871. The *New York Tribune* pronounced it "By far the largest, stateliest, most costly and commodious edifice devoted to like purposes on the continent, an ornament to our city and a credit to our architecture." It was constructed under the supervision of Mr. I. C. Buckout, M. Am. Soc. C. E. It covered four acres of land, and had two acres of glass in the roof of the train-shed. It took five miles of electric wire to illuminate the clocks, and 15 miles of steam pipe to heat the building.

The New York, New Haven & Hartford Railroad enters this station under a perpetual agreement with the New York & Harlem.

The construction of the Grand Central Station included the sinking of the tracks and the construction of the present tunnel in Park avenue, one-half of the cost of which was borne by the city. In 1893, 1894 and 1895 all grade crossings in Harlem were eliminated by the construction of a four-track steel viaduct in Park avenue from 106th street to 149th street, including stations at 110th, 125th and 138th streets, and the great 400-ft. draw bridge over the Harlem River. This work was executed under the direction of Mr. Walter Katte, M. Am. Soc. C. E., Chief Engineer of the New York Central, at a total cost of several million dollars.

The wisdom in the selection of the present site as the terminal of a great trunk line has been clearly demonstrated by the fact that 30 years after its construction it is still not only the center of the residence district but will probably remain so for many years to come, as will be readily seen from the gradual northward movement of the residence centers of New York City.

Residence Centers of New York City.

1820. Bowling Green and The Battery.
1830. Bond and Bleecker streets.
1840. St. John's Park.
1850. Washington square.
1860. Fifth avenue and Fourteenth street.
1870. Fifth avenue and Twenty-third street.
1880. Fifth avenue and Thirty-fourth street.
1890. Fifth avenue and Forty-fifth street.
1900. Fifth avenue and Fifty-ninth street.

In 1899 the station was reconstructed, the waiting-rooms, baggage and other facilities being remodeled at a large cost.—*Railroad Men.*

Recent Progress in the Design of Locomotive Front-Ends.*

The front-end is to be regarded as an apparatus for doing work, receiving energy from a source of power, and delivering a portion thereof in the form of a specific result. The source of power is the exhaust steam from the cylinders, and the useful work accomplished is represented by the volumes of furnace gases which are delivered against the difference of pressure existing between the smoke-box and the atmosphere. That the power of the jet may be sufficient, it is necessary that the engines of the locomotive exhaust against back-pressure. The presence of the back-pressure tends to lower the cylinder performance, and it is for this reason that designers of front-ends have sought to secure the required draft action in return for the least possible back-pressure. In other words, the effort has been to increase the ratio of draft to back-pressure, which ratio has been defined as efficiency of the front-end.

During the 75 years which have passed since Stephenson in the construction of the "Rocket" first turned the exhaust from the cylinder into the stack, no other detail of the locomotive has been subjected to such persistent experimentation as the front-end. Unfortunately, the investigations have in most cases dealt with apparatus that was highly specialized, or have been influenced by conditions which do not now prevail, and it is only recently that efforts have been made to secure fundamental data upon a plan sufficiently broad to be of permanent service. During the last few years, however, much good work has been done.

Distribution of Draft.—Under normal conditions of running the draft is usually represented by from 4 in. to 6 in. of water. The draft thus expressed, however, is greater than that to which the fire is actually subjected; for, approximately, a third of the total draft is required to overcome the resistance of the ash-pan and grate together with the fire thereon; another third is required to overcome the resistance of the tubes, and another third to overcome the resistance of the diaphragm. For example, if the total draft is 6 in., it will be found that the draft in the fire-box is approximately 2 in., at the front end of the tubes approximately 4 in., and in the forward portion of the smoke-box 6 in. These facts serve to explain several things which ordinarily are not well understood. The fact that the diaphragm absorbs as much of the energy of the exhaust jet as the grate and all the fire thereon, should have in it a suggestion for those who are endeavoring to improve the locomotive front-end. If the diaphragm could be abandoned, or if the area under it could be materially increased without introducing new difficulties, the efficiency of the front-end could be greatly improved.

The question has often been asked how it is that ordinarily a wide fire-box engine will not run with a larger exhaust nozzle than the narrow box engine. The assumption behind this question is that since the grate is large, the draft necessary to stimulate the combustion is reduced, and hence the work which the steam jet has to do is diminished. The preceding statements give a response to such questions. Whether the grate be large or small, two-thirds of the difference in pressure between the front-end and the atmosphere is absorbed in moving the air and gases through the tubes and under the diaphragm. The volume of air and gases to be moved is not materially changed by changing the area of the grate, and while the difference in pressure between the atmosphere and the fire-box will be less with the large grate than with the small one, this difference is insignificant in amount when compared with the total draft action which is required to eliminate the movement through the remaining portion of the systems.

The Action of the Exhaust Jet.—Under this heading are reviewed the experiments and findings of the 1896 report of the Master Mechanics' committee, in which two important questions were settled, namely, the action of the exhaust jet, and the form for exhaust pipes and nozzles. The facts established by those experiments are summarized as follows:

1.—The jet acts upon the smoke-box gases in two ways; first, by frictional contact, it induces motion in them, and, second, it enfolds and entrains them. The action is chiefly that of induction.

2.—The action of the jet upon the smoke-box gases is to draw them to itself so that the flow within the front-end is everywhere toward the jet.

3.—The action of the jet is not dependent upon the impulses resulting from individual exhausts. Draft can be produced by a steady flow of steam as by the intermittent action of the exhaust.

4.—Draft resulting from the action of the jet is nearly proportional to the weight of steam exhausted per unit of time. It does not depend upon the speed of the engine nor the cut-off of steam from the cylinders, except in so far as these affect the weight of steam exhausted.

5.—The form of the jet is influenced by the dimensions of the channels through which it is made to pass. Under ordinary conditions, it does not fill the stack until near its top. If the diameter of the stack is changed, that of the jet will also change.

Form of the Exhaust Nozzle.—Two general forms of exhaust pipe and nozzle have for many years been in common use, one a "double pipe and nozzle," in which the exhaust steam from each cylinder follows a separate passage throughout its course to the point where it is delivered, and the other, a single exhaust pipe and nozzle in which the exhaust steam from both cylinders is brought together to form a single jet before delivery. The double exhaust pipe might, so far as its function is concerned, be made up of two separate castings, but for convenience the parts are combined. Many other forms of exhaust pipes had been used, and are still in service, but the probability is that none possessed exceptional advantages as compared with the two forms mentioned. As one of the conclusions of their long and laborious investigation of 1896, the Master Mechanics' committee found but little difference in the efficiency of the single and double nozzle when each is properly proportioned to its work, though incidental reasons seem to favor the single nozzle. The committee therefore concurred in the recommendation of the previous committee in recommending that the single nozzle be adopted for general use.

Height of Exhaust-Pipe and Tip.—It has been shown beyond question that the lower the exhaust tip, the better will be the draft. From the data derived from the tests of the *American Engineer*, it should be possible to derive an expression, showing the change in draft power resulting from given changes in the height of the nozzle, but thus far such an expression has not been proposed. It may be said, however, that the gain in draft power which may be had by lowering the nozzle even a few inches is sufficient to justify some sacrifice of convenience if the arrangement of other details demand it. The Master Mechanics' committee of 1896 expressed the belief that in view of the other apparatus to be accommodated in the front-end, it will be found impracticable to have the exhaust-pipe less than 19 in. high.

Height of Bridge in Pipe.—An essential feature of the single exhaust pipe is the so-called bridge which maintains a separate steam passage for each cylinder for a portion of the length of the pipe. It is above the top of this bridge only that the steam exhausted from both sides of the locomotive intermingles. The purpose of the bridge is a two-fold one. It prevents the exhaust of one side from blowing through into the exhaust passage of the other side, and when properly designed it is the means of making that side from which the strongest stream is passing assist by induction the exhaust from the other side. To determine the best height of the bridge, exhaust pipes of four different designs were tested by the Master Mechanics' committee, all being the same except in the height of the bridge and in the proportions of those parts adjacent thereto. The conclusion of the committee was that whenever the bridge was less than 12 in., some loss of efficiency resulted, though such loss was not great even when the height of the bridge was reduced to 5 in. They recommend that the bridge be not less than 12 in. They recommend, also, that where long exhaust pipes must be employed, that the increased length should always be secured by extending that portion of the pipe which is above the bridge. This recommendation in effect contemplates a constant height of bridge for all lengths of pipes.

Area of Choke.—That part of the steam pipe between the bridge and the outside wall where the contraction of the passage is greatest has generally been referred to as the "choke." An early committee had recommended that the area of the choke be 80 per cent. of that of the nozzle, and the committee of 1896 did a large amount of work upon pipes having this proportion. Not satisfied, however, with the validity of the conclusions, the later committee extended its research to involve a large range of proportions, with results sustaining the conclusions: First, that the area of the choke must not be less than the area of the nozzle, and, second, that whenever with a given pipe, it is necessary to sharpen the exhaust action, the result should be secured by contracting the nozzle, and not by contracting the choke.

Form of Nozzle.—Three forms of nozzle were experimented upon with results so nearly identical that the committee was unable to present convincing proof in favor of any one of them, though it recommends that the form with upwardly-tapering sides ending in a straight section at the top be used. The recommendation is based on the fact that this form spreads the jet less than the others, it having been shown in the study of the action of the jet that highest efficiency is had when the spread of the jet is least.

Bars or Crosses Over the Nozzle.—It is well known that engines which refuse to steam may sometimes be made to do so by bridging the exhaust nozzle with a small piece of round iron or by a bar or bars having a knife-edge cross-section designed to spread the jet and at the same time impede its motion as little as possible. Experiments were therefore made by the committee of 1896 both upon round bars and upon crosses, with results confirming previous experience upon the road. It was found that by spreading the jet by means of such devices, the draft could be improved, but in all cases, the presence of the bridge so much increased the back pressure that the efficiency of the front-end was reduced. In other words, the presence of the bar or cross produced the same effect upon the back pressure as the substitution of a smaller nozzle without the bars. They found that cross bars not wider than ⅜ in., and having the lower portion shaped to a sharp knife-edge, placed on the nozzle or any distance not greater than 1 in. above it, increased the back pressure, and that crosses having wider bars increased the back pressure at a greater distance from the nozzle. In view of these facts, and, also in view of the fact that all evidence goes to show that for highest efficiency the jet should be kept as well compacted as possible, the practice of splitting it up is not to be commended. It is better practice in cases where the draft is unsatisfactory to reduce the diameter of the exhaust nozzle than to attempt to secure the desired result by employing a larger nozzle with a bridge above it.

The Stack Problem.—A review of published accounts of experiments upon draft appliances under service conditions indicates that until recently but slight attention has been given the stack. This is not due to any lack of appreciation of its importance, but rather to the difficulties which are to be met in attempts to find a logical basis for its design. A measure of uncertainty which has in the past prevailed is indicated by the fact that many roads have had large and small engines running with stacks of the same diameter.

In the course of the *American Engineer* tests conducted on the Purdue locomotive straight stacks and tapered stacks were used, each form being represented by four different diameters and five different heights, so that in effect there were 20 different straight stacks and 20 different tapered stacks employed. Each of these stacks were tested in connection with seven different heights of nozzle and for many of them results were repeated under different conditions of speed and for different conditions of cut-off so that altogether something more than 1,000 distinct tests were made.

The results obtained confirm statements previously made from the Purdue laboratory to the effect that the efficiency of the front-end is not dependent upon the speed, cut-off or other conditions of running. A front-end arrangement which is efficient at one speed will be found efficient at all speeds, and an arrangement which is satisfactory at one cut-off will be found satisfactory at all cut-offs. These are facts which should prove important to future experimenters who, by accepting them may avoid multiplying observations by changing conditions of running. When the facts are known concerning a single condition, there is nothing to be gained by further increasing the number of tests.

Form of Stack.—An equal degree of efficiency can be secured by means of either the straight or tapered form of stack. As a problem in design, the tapered stack is the more simple, since its diameter for best results is not affected by changes in height. The straight stack, on the other hand, must have a different diameter for each

*Extracts from a paper by W. F. M. Goss, presented to the Central Railway Club, Nov. 13, 1903.

different height. Moreover, it appears that a departure from correct proportions in the case of the tapered stack is less harmful in its effect upon draft than in the case of the straight stack. For these reasons the tapered is to be preferred, and that which follows will chiefly concern this form. For the purpose of this presentation the tapered stack must be understood as one having its smallest diameter at a distance 17½ in. from the base, above which point its diameter increases at the rate of 2 in. per foot, these being the proportions of the experimental stacks by the use of which the following conclusions were reached. It should be noted, also, that the relations stated in the paragraphs which follow, with reference to stacks, are those which are known to apply to front-ends 54 in. in diameter. It is assumed that by employing the diameter of front-end as a unit of measure, they may be made to apply to any diameter of front-end. The assumption is a logical one but its validity has not yet been absolutely proven.

Proportions of Straight and Tapered Stack.—The proportions given in the paper are the same as those found in the 1903 Master Mechanics' committee report on front-ends.

In conclusion, it will be seen that investigations already made have served to make clear the action of the exhaust jet, and the condition of pressure which stimulates the currents of air and furnace gases throughout the course from the ash-pan to the top of the stack. Existing data are sufficient, also, to guide in the design of the exhaust-pipe and tip for maximum results. All this is to be accepted as a certainty. In addition, the probability is that we may design stacks for maximum efficiency though the statement must be subject to some qualification until the experiments already made at Purdue have been checked by trials involving larger engines either upon the road or testing plant. This settled, there remains of those elements which characterize the modern front-end, the problem of the draft-pipe, of the inside stack, by which is meant a stack extending downward into the front-end and terminating in a bell-shaped end, and of the inside stack in connection with a false top within the smoke-box. All of these questions are now under consideration by a committee of the Master Mechanics' Association, under the chairmanship of Mr. H. H. Vaughan, whose interest in the subject makes it not unreasonable to expect that within the next two years all portions of the front-end may be correctly designed by aid of logical formulæ.

Notes from the Middletown Shops of the New York, Ontario & Western.

The shops of the New York, Ontario & Western at Middletown, N. Y., were built in 1877 and like most other shops built 25 or 30 years ago, are wood framed structures and not adapted to the use of overhead traveling cranes. By the liberal use of air hoists and many special tools, however, the shops have been brought up to a high degree of excellence. The material in the yards is handled by pneumatic jib cranes and all of the large

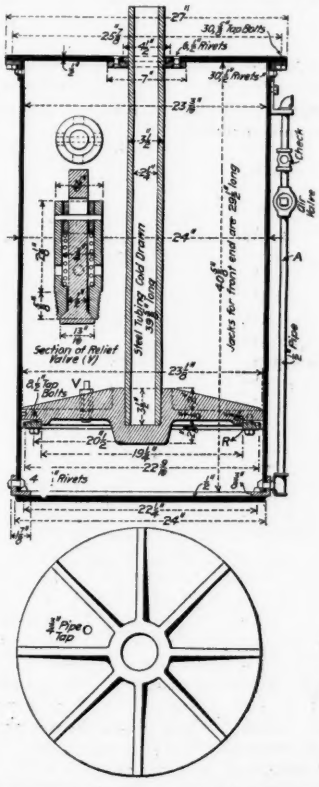


Fig. 1.—Pneumatic Jack for Raising Locomotives—Middletown Shops.

machines are served by individual hoists. By order of Mr. G. W. West, Superintendent of Motive Power, no material is allowed to be piled within 3 ft. of any building. This not only improves the general appearance of the shops but also facilitates the handling of materials into and out of the several buildings by providing a clear passageway.

For unwheeling locomotives, pneumatic jacks are used (see Fig. 1). Two of these are placed at each end of the locomotive, one on each side. The jacks for the rear end of the locomotive have cylinders 40⅝ in. long and those for the front end have cylinders 29½ in. long. The piston rods are made of ⅝-in. cold-drawn steel tubing, 3½ in. outside diameter. In raising the rear end of a locomotive, a beam 11 ft. 6 in. long made of two 8-in. I beams bolted together with a wooden spacer, is placed under the frame and rests across the center of each jack. Air pressure is then admitted to the lower side of the air piston through the pipe A which raises the beam and locomotive. When the desired height is reached, wooden blocking is built up on top of each jack until the cross beam rests on the blocking. The air pressure can then be relieved. In order to prevent the piston from breaking the upper cylinder head, a relief valve (V) is provided, which is shown in detail. When the piston

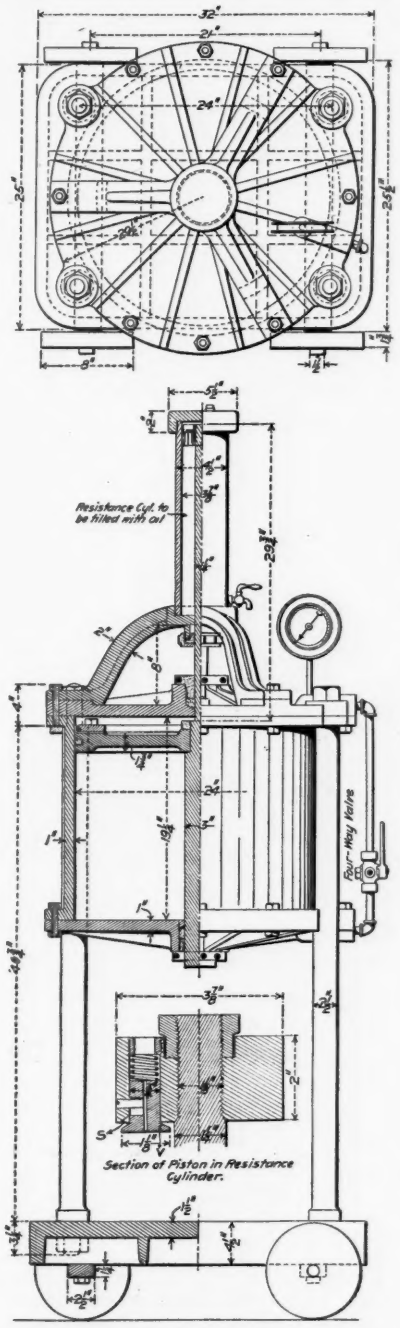


Fig. 2.—Pneumatic Press with Oil Resistance Cylinder—Middletown Shops.

gets within ¾ in. of the upper head, the valve stem is pushed downward against the pressure of the spring and air. This allows the air beneath the piston to escape through the valve, V. The piston is 23⁹/₁₆ in. in diameter and with 100 lbs. air pressure can exert an upward force of about 42,000 lbs.

A pneumatic press with oil resistance cylinder is shown in Fig. 2. This is used for forcing brass bushings into or out of rods, etc., and for similar purposes. With 70 lbs. air pressure a force of 20 tons can be exerted by the steel plunger. The resistance cylinder is provided in order to check the movement of the large piston when the pressure is suddenly relieved from the end of the plunger; otherwise the expansive force of the air would drive the plunger against the bed plate with disastrous results. The steel plunger rod is continuous through the air and resistance cylinders, passing through stuffing boxes in the upper and lower heads of the air cylinder and the lower head of the resistance cylinder. The piston in the resistance cylinder contains a valve which automatically controls the speed of the plunger. The resistance cylinder is filled with oil and as the piston moves downward the oil flows upward around the valve seat S (see detail of piston) and through the hollow valve. Any increase in the speed of the piston causes the valve V to move upward and diminish the area of the opening for the oil, thus increasing the resistance and diminishing the speed. If the resistance beneath the plunger is suddenly released, as when a bushing is forced out of a rod, the momentary increase of speed closes the valve V. The small hole through the center of the valve is always open so as to equalize the pressure after the valve V has closed.

The repair of triple valves has been given especial attention. Fig. 3 shows an adjustable reamer, the invention of Mr. Wm. Pohlman, foreman of the machine shop, and is used chiefly for reaming the bushings of air-brake triple or engineer's valves where the sides must be parallel. The reamer consists of a slotted body, A, adjusting screw, B, and a series of cutters, C, which are secured in position by the screws, D. The outside diameter of the body A conforms to the smallest bushing to be reamed and contains a series of grooves, E, in which slide the cutters C. The inside wall of each groove slopes outward at an angle of about 25 deg. as shown at F. The cutters, C, have a similar angle on their inner faces, and when the two angular faces are in contact and the cutters are moved downward, the outer diameter of the cutters is increased. The adjustment is obtained by means of the screw, B, which is provided with a square shank for a wrench. Near the lower end of B is an annular groove or recess which engages the notched-out upper edge of the cutters. When the screw, B, is moved up or down the cutters are moved in or out, thus varying the diameter of the reamer. A micrometer scale on the body, A, allows close adjustment. The reamer is used by placing a wrench on G and turning in the usual manner.

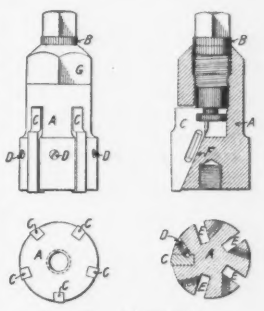


Fig. 3.—Adjustable Reamer—Middletown Shops.

Another interesting tool is shown by Fig. 4, which is a machine for grinding packing rings and slide valves in triple valves and engineer's valves. It is the invention of Mr. G. M. Curran, of the air-brake department. Heretofore the piston rings and slide valves have been ground by moving them vertically by hand while in place, using nothing but oil in the operation. Consequently the work was very tedious and required the services of an experienced man from one to eight hours on each triple valve. When the triple valve has been placed in the machine and the valve attached to the spindle, the grinding is done automatically without further attention from the operator.

An iron plate, A, (Fig. 4) is secured to the wall in a perpendicular position and forms the bed plate of the machine. The air motor, D, is attached to the bed plate and drives the shaft (a) although power may be furnished by a belt. The rod, F, is moved back and forth by means of the connecting rod G, which is driven from the disc C, which revolves with the shaft (a). The upper end of the connecting rod G has a bearing for

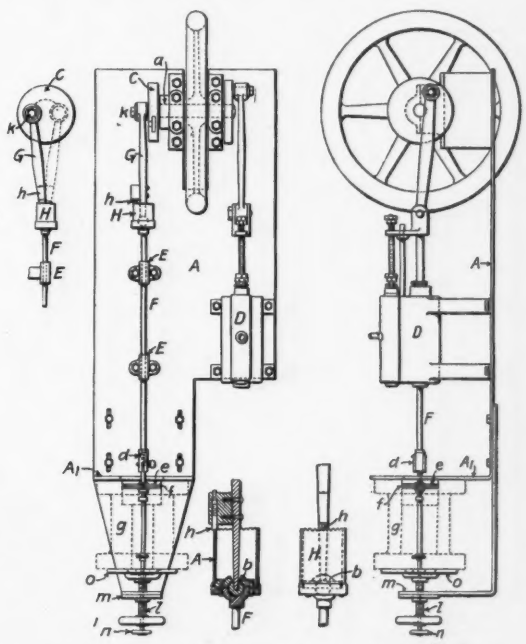


Fig. 4.—Machine for Grinding Packing Rings in Triple Valves—Middletown Shops.

the crank pin and the lower end is connected to the spindle F by a ball-and-socket joint. The socket is formed in the bottom of a hollow cylinder, H, shown herewith in detail.

The lower end of spindle, F, has a grip or clamp (d) which holds the triple-valve piston (e) with the packing rings (f) in the grooves provided for them. The position of the body of the triple valve is shown by dotted lines. As the spindle, F, moves vertically the piston is carried with it and the friction of the rings against the bushing wears them to a perfect fit. The spindle, F, is also rotated about its own axis by means of the pawl (h), which works in a series of teeth in the upper rim of the cylinder H, the motion being obtained from the oscilla-

tion of the connecting rod, G, to which the pawl is secured. The piston packing rings are thus revolved while making a vertical stroke and any inaccuracies in the rings (f) or the bushing are ground to a uniform diameter.

In grinding the slide valve the packing rings are removed and the pawl (h) is also held up from the teeth of the cylinder H. A special spindle for grinding slide valves is desirable so that there should be no end movement of the valve on the spindle while being ground.

The triple-valve body is securely held by being forced upward against a projection, A_1, on the plate by means of a screw (l) which passes through the threaded foot (m) of the machine. The disc (o) on the top of screw (l) is recessed out to fit a projection on the lower part of the triple-valve body so that the valve can be readily centered. The screw (l) has a hole through its entire length in which is placed a light rod with a button head on top to keep it from dropping out and a knob on the handle (n) on the lower end. If the piston should fit tightly, it can be raised by pushing upward on the knob. The spindle F is run at a high speed and five minutes grinding usually furnishes a perfect fit.

We are indebted to Mr. G. W. West, Superintendent of Motive Power; Mr. W. H. Davis, Mechanical Engineer; Mr. P. H. Minshall, General Foreman, and others for the drawings and information.

The New York Central's Short Haul Competitors.

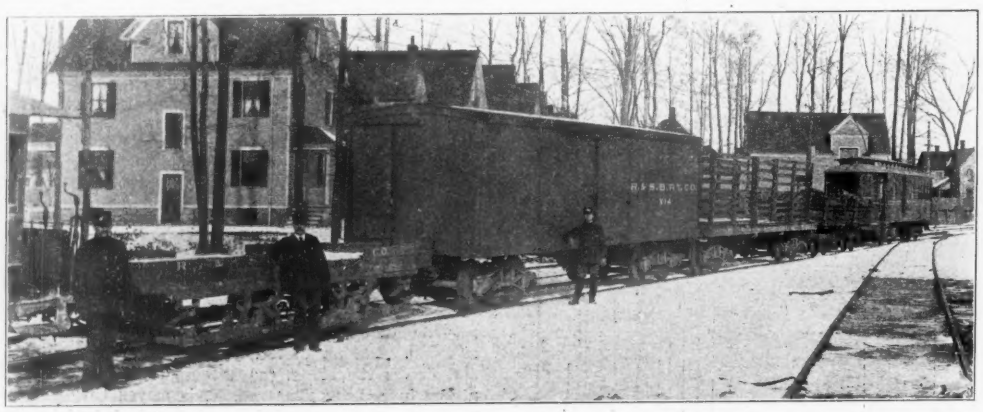
The rapid extension of electric lines paralleling portions of the New York Central system, within the last three or four years, has given rise to many press rumors about the attitude of the steam road to these competitors. The most recent of these reports, to the effect that the Rome, Watertown & Ogdensburg would be in part electrified, is entirely premature, so far as any active plans have been made. The electrification of the New York terminal has been undertaken, on a scale undoubtedly larger than any similar installation in this country, if not in the world, and the chance seems good that after this has been completed and its lessons learned, further lines will be equipped with electricity, particularly in competitive, short haul territory. But for the present, short haul business in the vicinity of the large cities is undergoing great changes, and the New York Central, in common with other steam roads similarly situated, is failing to hold its own share of the increased traffic. The situation in a word is that the steam railroads have been taken quite unprepared by the recent development of interurban lines, and are not able to compete with them vigorously in the limited field in which they operate.

In 1895, the New York, Chicago & St. Louis carried 42,526 passengers between Cleveland and Lorain, 26 miles. In 1902, with the Lake Shore electric paralleling it, the steam road carried 9,795 passengers between these points, while the electric road earned nearly half a million, gross. In 1895, the Lake Shore & Michigan Southern carried a total of 199,292 passengers between Cleveland and Oberlin and intermediate points; in 1902 it carried 28,708. The Cleveland, Elyria & Western (electric) earned over $300,000 the same year, in the same territory, although the greater length of the electric line and additional points reached make a comparison impossible in further detail. In 1900, the Rochester & Sodus Bay (electric) commenced business, paralleling the Rome, Watertown & Ogdensburg along the southern shore of Lake Ontario for some distance out of Rochester, and doing quite an important freight business, in addition to its passenger traffic. The rate on the steam road last summer was 30 cents single and 55 cents round trip, or less than a cent a mile between Rochester and Williamson. The rate on the electric road is 10 cents more for a single ticket and 5 cents more for a round trip ticket, and the running time of the electric cars is quite a little slower, yet the number of Williamson-Rochester tickets sold by the Rome, Watertown & Ogdensburg in a single month this year was only about 70 per cent. of the number sold the same month three years ago (see *Railroad Gazette*, Aug. 21, 1903, page 601).

This last statement is worthy of careful attention, for when an electric road running in the same territory with a steam road can charge higher rates for a 40 mile run, run cars slower, and yet get the business, there must be a reason for it, and it is a reason that must be looked into pretty sharply by steam railroads that propose to compete with the electric lines. The fact that the electric cars, first of all, are more convenient, that they are cooler in the summer time, and that they run much more frequently, are doubtless the impelling causes in gaining the short haul traffic, and, even if the steam road should electrify its line, thereby securing the advantage of being able to run small units of transportation, it would be comparatively little help to it in competition with the one striking advantage which the electric roads have in their use of highways in the country and city streets.

But there is another way in which a steam road can compete with electric cars. There seems to be no reason why an interurban car owned by a steam railroad cannot start at the City Hall and run up Main street with all the freedom of a local electric car and then switch over on to the steam roadbed and make the run to the next terminal on full railroad time, after which it could distribute its passengers as it had collected them. New York Central officers are inclined to regard this plan with favor, in connection with possible future electrification of branch lines, and it seems not unlikely that at least a partial solution of the problem of the electric road competition can be found here. It would, of course, be impossible to run a car in this manner where the steam railroad line lay three-quarters of a mile or so from a succession of villages to be reached, because of the zigzags which would be involved in switching the car back and forth, and this is exactly the situation which confronts the Rome, Watertown & Ogdensburg. But there are many other short haul points, as between Albany and Schenectady, Syracuse and Baldwinsville (D., L. & W.), and other localities which have from time to time been described in the *Railroad Gazette*, where it would seemingly be possible to run what might be termed a main line service with street railroad terminals, and probably, in some localities, a considerable single-car, local express service might be developed from the terminal to a number of points.

In the meantime, the steam railroads have the consolation, as pointed out in previous articles, that what is lost in the short haul traffic not infrequently finds its way back again in through traffic. The suburban territory is built up, and people are started traveling.



Freight Train on Regular Run, Rochester & Sodus Bay Road.

A New Bullard Boring and Turning Mill.

A new pattern of Bullard 42-in. boring and turning mill, having one fixed turret head and one swivel head, is shown in Fig. 1. Two swivel heads can be supplied if required, but the machine is regularly made in the form shown. It has a side drive, which permits of a motor (constant or variable speed) being applied at any time in the most economical manner.

The cross-rail heads are operated at a constant speed by power obtained by driving the vertical feed-rods from the overhead shaft, or at a variable speed through an independent feed-box on the bed at the lower end of the rods. Lever A, or A′, which is movable in both directions from its normal position, operates an expansion clutch mechanism in the bevel gears of the over-head bracket, rotating the vertical rods in either direction, as required, and driving the cross-rail heads through the regular feed brackets on the back of the rail. The cross-rail heads are traversed at a speed approximating 10 ft. per minute, which can be modified if thought desirable. When the lever is in normal position, the overhead clutches are disengaged and the feed-works of the lower brackets are automatically engaged with the vertical rods. This construction makes it impossible for the quick-traverse device to become engaged at the same time as the feed-works, and obviates the necessity of the operator disengaging the feed-works before operating the quick-traverse.

This feature is valuable in such work as turning a gear blank which requires facing of both the rim and the hub. The feed having been engaged for facing the rim, at the completion of this operation the quick-traverse can be engaged with one movement of the lever, and the tool passes over the intervening space between the rim and the hub at the rate of 10 ft. a minute. Upon releasing the handle, the feed immediately becomes engaged and completes the operation. This also applies to the vertical and angular feeds and increases the productive capacity of the machine.

The feeds are positive, having ten changes ranging from $^1/_{32}$ in. to $^3/_4$ in. horizontally, and from $^1/_{50}$ in. to $^1/_2$ in. in angular and vertical directions. In the cross-rail bracket on each head the feed is engaged and disengaged by a toggle friction clutch, operated by levers B and B′. This toggle friction clutch serves a double purpose, in that it gives a quick means of engaging and disengaging the feed, and also answers the purpose of a safety device to prevent accident in case of the heads being run together either by the quick-traverse or feed mechanisms.

The right-hand head is used for screw cutting, and has screw-cutting gears entirely independent of the feed gears, the feeds being engaged by the toggle friction clutch above mentioned. The reverse movement of the lever B engages the screw-cutting gears by means of a positive clutch, so that it is possible to bore a hole with as fine a feed as required and, without changing

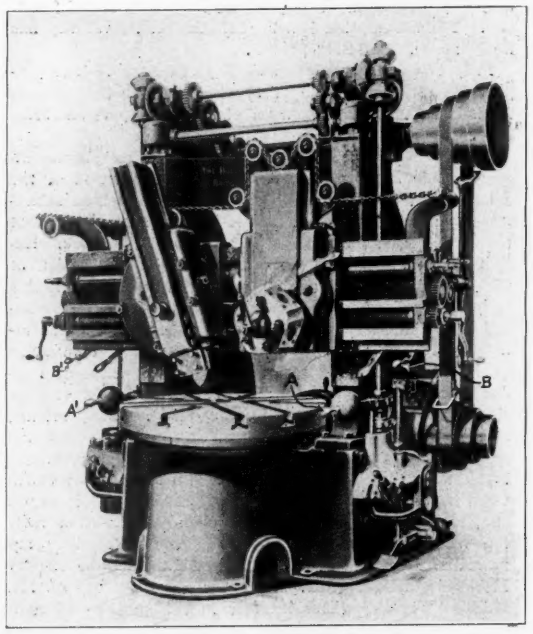


Fig. 1.—Bullard 42-in. Boring and Turning Mill.

any gears, immediately chase the hole with the coarsest thread for which the machine is geared. The turret head is arranged for cutting all standard threads from 2½ to 12 per in.

The design of the cross rail is shown in Fig. 2, which shows the left-hand end of the cross-rail and the swivel head. It is designed to enable alinement to be maintained regardless of the severity of duty required of the machine. The length of the bearing surfaces of the saddle on the rail has been increased, and the width narrowed. Horizontal alinement is obtained on surfaces A and B with the screw located as near central as possible. The saddle is gibbed back against the rail, receiving its thrust on surfaces D. The saddle does not bear on surface E, but is gibbed between surfaces F and G. The saddle is of the square locked type, having no loose joints; taper steel gibs are used for taking up adjustment. This type of bearing is also used for maintaining the alinement of the cross-rail with the right-hand upright, the left-hand upright merely acting as a support.

The high-speed journals are all of the ring-oiling type and have bronze bushings, oil being carried through the bearings by means of spiral grooves cut on the shaft, both right and left hand. The belt shifter enables the operator to shift the cone-pulley belt from one step to the other easily and quickly without danger of injury to his hands. This can be done with the machine under full load. The foot brake seen at the right-hand side of the machine applies directly to the large step of the lower cone pulley and brings the table to a stop at any predetermined point for tightening chuck jaws or for truing up work. If this device were not employed, considerable time would be consumed in coming to a stop.

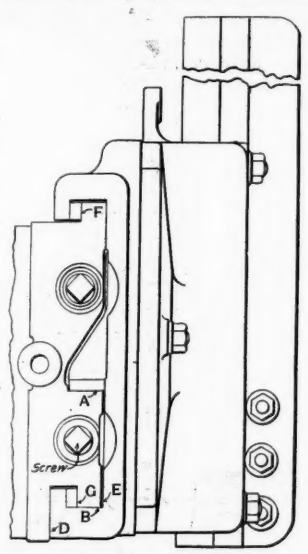


Fig. 2.—End Elevation of Cross-Rail and Swivel Head.

The headstock gears are entirely incased and run in an oil bath, insuring ample lubrication and quiet running. The counter-weighting of the heads is accomplished by passing the chain back of the center, so as not to interfere with any tackle which may be used for loading work on the table. As quite heavy turret tools are likely to be used in the right-hand head, small weights are provided for increasing or decreasing the weight.

The table spindle is of the regular Bullard type, the

vertical thrust being taken on an angular bearing 24 in. in diameter, and entirely immersed in oil. The table has parallel slots for receiving the new Bullard spiral chuck jaws, but a combination chuck can be fitted if required. The weight of the machine is 14,300 lbs. net. It is made by the Bullard Machine Tool Company, Bridgeport, Conn.

Electrically-Operated Roundhouse Turntables.

BY FRANK C. PERKINS.

One of the earliest devices used in this country for operating turntables electrically was known as the Westinghouse turntable "donkey," shown in Fig. 1. It was simple and easily operated. A 10-h.p. series reversible direct-current motor was mounted within a heavy cast-iron frame, the latter having a traction wheel resting upon the rail of the turntable pit. The power was transmitted through double-reduction gears, and the frame was connected to the end of the turntable at one side by a drawbar. This "donkey" weighed about two tons, which gave sufficient adhesion for the driving wheel. At one side of the platform near the center of the turntable was a controlling rheostat for varying the speed of the turntable as well as the direction of operation.

These early types of electric turntables demonstrated that electric power was far more economical than small boilers and engines. It was also demonstrated that the electric turntable was cheaper to operate and quicker in its action than turntables operated by push poles. In one case where 176 engines were required to be turned in 24 hours four men were needed to handle the seven engines per hour; while with the electric outfit one man was able to do the same work and turn each engine quicker; a 10-wheel locomotive being turned in less than a minute.

A new type of electrically-operated turntable has recently been brought out by the General Electric Company. Fig. 2 shows one in use at the Scranton shops of the Delaware, Lackawanna & Western; others are in use by the Pennsylvania at Altoona; by the Erie at its Jersey City yard, and by the Southern Pacific at its Sacramento shops (Fig. 3), the motor for the latter being 25 h.p. All are controlled from a platform near the center of the table.

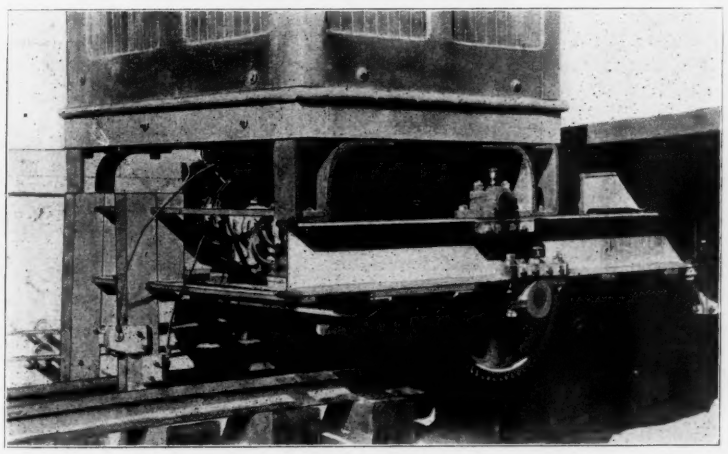


Fig. 2.—General Electric Turntable at Scranton Shops of the D., L. & W.

The General Electric turntable is operated by a series-wound direct-current railroad motor, which, being enclosed and dust and water-proof is not subject to breakdowns even with the roughest usage. This type of motor is especially adapted to this class of work, as it must be frequently subjected to heavy overloads for short periods, frequently started under trying conditions and accelerated to the highest speeds in the shortest possible time. It is mounted on a single-wheel truck with ordinary gearing and is controlled by a circuit-breaker and a starting rheostat. Induction motors are employed in some cases where three-phase current only is available, in which case motors with slip-rings are used with external resistance for varying the speed. Some electric turntables have motors of the direct-current type with capacities as low as 8 or 10 h.p., but the latest practice is to employ railroad types of motors of 20 or 25 h.p.

It is estimated that the power required to turn a table 60 ft. long, carrying an engine of 100 tons, is about 10 h.p. when a single revolution is made in 40 seconds, although the momentary starting load is considerably higher than this.

The current is conveyed to the motor in some cases by trolley wires placed on the walls of the pit, and in other cases by collector rings and brushes at the center of the turntable. Another method is to use an overhead arrangement with brushes and collector rings; but brushes and collector rings at the center of the table is considered more practical, the current being conveyed underground from the generating station to the stationary collector rings through the center casting. Regardless of the position of the turntable a good contact is made with the stationary rings by the brushes affixed to the table. When the construction of the turntable is such as to prevent this method of conducting the current to the motor the first method mentioned above is used. A pair of trolley wires are supported by hangers along the wall of the pit and short trolley poles are fixed to the motor truck, allowing a horizontal movement so that the trolley wheel may follow the wires with their varying distances from the wall, being closest at the hangers and farthest away midway between.

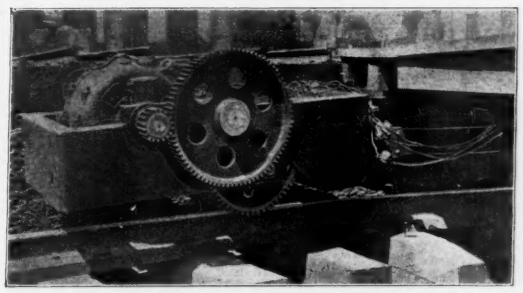


Fig. 1.—Westinghouse Electric Turntable "Donkey."

Some of the advantages of an electrically-driven turntable over the steam-driven types are that the power is consumed only when the table is in operation, and is directly in proportion to the work accomplished; that the speed control is as nearly perfect as possible, and that the cost of operation and repairs is far lower than with other methods employed.

An Old Chain Suspension Bridge.

The accompanying engraving is of a chain suspension bridge at Newburyport, Mass., which was built in 1826-1827. The engraving is reproduced from the original drawing furnished us by the president of the Baltimore Bridge Company, Mr. Nathaniel Haven, whose grandfather, Thomas Haven, designed and built the bridge. Mr. Bissell, Chief Engineer, Boston & Maine, has gleaned some items in the history of the structure from Mr. Albert Currier, an aged citizen of Newburyport, who clearly remembers the building of it.

March 4, 1826, James Prince, John Wood, Stephen Frothingham and other persons associated with them were authorized to erect a bridge over the Merrimac River from a point between Kent and Market streets in Newburyport to a point in the town of Salisbury, and also to build a road four rods wide from the approach to the bridge on the Salisbury side to the county road leading to the meeting house in East Salisbury. The river at this place is about 1,000 ft. wide, and, as the drawing shows, the original bridge consisted of three suspension spans, each about 200 ft. from center to center of towers, two anchorage spans and a narrow bascule draw span on the Newburyport side. The cables were of wrought-iron links arranged in four groups of three cables each. These chains had a breaking strength of about 20 tons, being tested to 18 tons before erection. The total load on the cables was 74 tons, giving each chain a working load of six tons, or a factor of safety of about three.

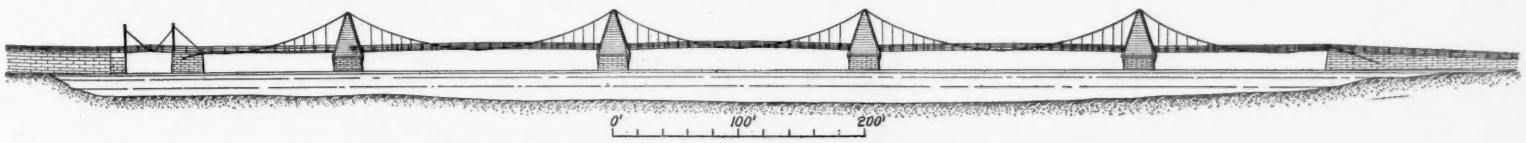
Work on the piers was started in 1826, and on Sept. 1, 1827, the bridge was opened for traffic. The piers were built on a wooden crib work of pine logs, the first course of masonry being started a little above low-water line. The cribs were 28 ft. x 40 ft. at the bottom and 20 ft. x 30 ft. at the water line. The masonry was granite and was built up 15½ ft. from the top of the cribs with a slight batter on all four sides. On top of the masonry, towers 31 ft. high were built of 14 in. squared timbers, boarded and shingled. Shrouds of 1¼-in. square iron were carried up over the tops of the towers and were anchored in the stone work of the piers a little above high-water mark. Saddles, 16 in. long, were placed on top of each pier on which the cables rested.

The company formed to build the bridge issued 1,000 shares of stock with a paid-up value of $70,000. The tolls for the first year were $2,783.53 and for the second year $4,358.05. In 1840 the Eastern Railroad, now the Boston & Maine, reached Newburyport. The directors of the bridge company objected strongly to the construction of another bridge across the river, claiming that it would reduce the receipts of the existing bridge, which were barely enough to keep it in repair. As a result the Eastern Railroad purchased of the directors of the Newburyport Bridge Co., in 1840, the right to erect on the old piers a suitable structure to carry its trains and the foot and wagon traffic as well. The consideration was $8,000 and the railroad company agreed at the same time to "keep in repair and maintain in good condition forever, at their own cost and expense, every part of the bridge and structure, including the piers and abutments excepting the first or lower floor" which the bridge directors agreed to keep in repair.

The superstructure of the original chain suspension bridge, after having stood for 13 years, was removed and a double-deck wooden bridge built in its place on the original piers. The railroad was carried on the upper deck and street traffic on the lower one, the bridge company collecting tolls for teams and pedestrians as before. This double-deck bridge remained in use until 1868, when it was removed and a new wooden highway bridge built on the same old piers. Previous to this the Eastern Railroad had built a new bridge of its own further up the river and no longer used the tracks on the double-deck bridge. When the new highway bridge was built it was made free for travel by an act of the Legislature passed in the same year. The charter of the bridge company having expired, no damages were awarded to the stockholders.

This third highway bridge remained in use until the present year, when it was closed for traffic. A portion of it near the Salisbury shore was carried away by ice and high water about 30 years ago and an iron truss was erected in its place. All that is left of the original chain bridge are the channel piers.

Fig. 3.—Electrically-Operated Turntable at Sacramento Shops of the Southern Pacific.



Chain Suspension Bridge at Newburyport, Massachusetts, Built in 1827.

Foreign Railroad Notes.

A committee of which Count Ignatieff is the president is studying the question of connecting the railroads of Finland with those of Russia. The committee proposes to build a bridge over the Neva River at St. Petersburg, and build a connecting link with the line to Moscow.

In spite of the industrial depression in Russia, of which great complaint is made, the railroad earnings were more than 3 per cent. greater in 1902 than the year before, and very nearly the same per mile of road—$8,604 against $8,619. This is as nearly as may be the average in this country, $8,625.

Experiments have been made with three different new locomotives on the line of the Berlin City Railroad (an elevated railroad on a masonry viaduct, giving entrance to the city to some through long-distance trains, but serving chiefly for city and suburban travel). The object was to ascertain the most suitable motor for the city traffic, and the relative economy of steam and electricity, which latter has been strongly urged. The maximum speed heretofore has been 28 miles an hour for the city trains, which sometimes consist of 14 cars, and it was desired to test the practicablity of increasing this speed to 31 or even 37 miles an hour. The only engine found capable of hauling a 14-car train at these speeds was an eight-wheel engine with six wheels coupled, using superheated steam. For such trains steam was found 28 per cent. cheaper than electricity. But it was decided not to increase the speed of trains. The higher speeds, though found practicable, required 31 per cent. more fuel, and, on the crowded line with stops at short intervals, were considered dangerous.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 83 Fulton Street, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Friction Draft Gear for Wooden Cars.

Of the total number of cars in use to-day only a very small proportion are built of steel or have steel underframes, yet the chief concern of motive power officers has been and still is to find some form of draft gear that will effectually protect the steel car. However wise and necessary this may be, it is nevertheless well to keep in mind that the smaller capacity car needs protection from shock quite as much as the big car so long as they are hauling both kinds intermixed in long trains with powerful engines. It is the cumulative effect of a number of cars starting or stopping, not the load in any one car, which causes failure of the draft attachments.

Perhaps it is true that the makers of friction draft gear have paid too little attention to devising a satisfactory form of gear for cars with wooden sills. Since the tests on the Lake Shore & Michigan Southern, a year and a half ago, when the shocks in the train were found to often exceed 150,000 lbs., the chief aim of the friction draft gear designers has been to make a gear with a capacity for absorbing shock equal to that figure. Some of them have partially succeeded, but such a gear is of little use when coupled to a following car having a single spring gear with a capacity of 20,000 lbs. or less. Nor is such a gear practical when applied to a car with wooden draft sills, oftentimes insecurely attached to the underframe. Tests under the drop have shown that the common forms of bolted and keyed attachment of wooden draft sills begin to fail under blows of 90,000 lbs. to 100,000 lbs. If a friction gear with a capacity of 130,000 lbs. were put between such sills, the failures of draft gear would be changed to the more expensive failures of draft sills. With the low capacity spring gear much of the excess shock is transmitted from the coupler horn through the buffer block and end sill direct to all the longitudinal sills and the draft sills are not so severely punished; but if the coupler horn could not come against the buffer block until the 130,000 lbs. capacity of the friction gear had been exhausted, the draft sills would have to take the whole effect of the blow.

There is a rational and easy way out of such a difficulty and that is to make a friction gear equal to or slightly less in capacity than the strength of the draft sills. The logical but unfortunately the impossible thing to do would be to make the strength of the draft sills equal to the capacity of the high resistance draft gear. Many cars would have to be completely rebuilt between the end sill and the bolster before this could be done, and such an expense would not be justified under any circumstances.

Of course a friction gear of 80,000 lbs. or 90,000 lbs. capacity would not be as efficient as a gear of 130,000 lbs. capacity, but it would be a great improvement over the spring gear. The absorption and dissipation of the energy of the blow which takes place with friction draft gear would be equally as effective to a less degree with the smaller capacity gear as in the higher capacity one, and the beneficial effects of the friction gear would extend clear through the train instead of intermittently as is now the case with a preponderance of spring gears mixed in with friction gears and taking up and giving out the surges in the train. It will be a long time before the last of the old light capacity cards with wooden sills will have found their way to the scrap pile and some means needs to be taken to protect them from the blows of the heavier cars with which they must be run. The use of a comparatively low capacity friction gear is a natural expedient in such a case.

Running Trains "Under Control."

The disastrous collision at Indianapolis, October 31, killing 16 passengers, appears to have been caused by lax enforcement of the rule requiring all special trains to run under control while within yard limits. As the victims were all in a car next to the tender, one is tempted to demand that every passenger train shall have a baggage car; but it is to be borne in mind that the people who, in the Irishman's phrase, have saved their lives by not being in the forward car are no more numerous than those who have enjoyed the same immunity because there happened to be an empty passenger car at the rear end of a train; an absurdity to which Col. Yorke invites attention. The true remedy, of course, is to prevent collisions. The only rule concerning cars is to have all in a train of equal strength, and of uniform resistance to longitudinal compression. Perhaps the most significant thing in the testimony concerning this collision is the engineman's claim that if he had not made the schedule time specified in the despatcher's order he would have been obliged to go into the superintendent's office to explain. This indicates that he knew that he was bound by the rule to run under control within the yard limits, but that the notion that rules can be stretched also had a place in his mind. The coroner asserts that he is going to find out where the blame actually rests, and it will be for him to discover whether or not the yard-limit speed-rule has been habitually disregarded. He is reported as saying that he will place the blame, not on conductors or enginemen, but "higher up." To do this he will have to show that violations of the rule have occurred before and have been winked at by the officer in charge.

To run under control in a yard when time is short demands of the engineman good judgment, based on long practice, perfect familiarity with the line through the yard, and the faculty of acting quickly. To do this every day a runner must maintain a high standard of mental alertness. The Indianapolis runner says that if the freight cars which were in his way had been at rest he could have stopped or nearly stopped before touching them. What then is meant by "under control?" The ordinary definition is to be able to stop before striking an obstacle in sight. If, for example, the track can be seen for 500 ft. in advance, the speed must be such that the train can be stopped in that distance. This is the construction of the rule by which this engineman now wants to justify his speed. It is clear enough on a double track line, where trains on a given track always run in one direction only; but how can the engineman calculate on a single-track line? If the obstructing car or engine has the right to come towards him, the 500 ft. estimate is not formed in his mind before the distance begins to be rapidly shortened. And if he must run so as to be able to stop before bumping a car moving toward him, he must know how fast it has the right to thus move. In short, it is plain that if a single-track line is at all curved, or the view is at all obscured by fog or smoke, the under-control rule is not practicable in ordinary train service, unless the yard trains are required to use the main track in one direction only. With a short yard and with all trains stopping at a station in the center of it, this use of a main track in one direction (while its use in the opposite direction is forbidden) may be practicable; but to safely make such practice general is a difficult thing.

According to another bit of evidence published in Indianapolis, though not, so far as we have learned, presented before the Coroner, the yard conductor had no notice of the extra train, but the operator at North Street received a notice (when, is not stated) which he tried to deliver to the yard conductor after it was too late to avert the collision. Here we have a reminder of another practice which has always been common but which is vicious, in that it divides responsibility in an uncertain way; the practice of telling yard men, by rule, that incoming extra trains will approach under control, yet sending a telegraphic notice which virtually instructs—or is in practice held to instruct the yard man to look out for the extra. This is the survival of the underlying idea of the older practice of instructing yard men always to protect themselves against extras without notice, yet invariably sending a telegraphic notice of each extra train. That in trying to sit on two stools, one is very likely to fall to the ground has been said in this connection many times before; but it seems to be the most appropriate thing to be said now, again. It is the most appropriate thing to be said if we are to continue the old methods; but the only adequate remedy is the absolute block system. The gravity of the problem of securing perfect service by the old method, the "American despatching system," is strikingly suggested by one of the statements of the Indianapolis engineman. He said:

> The last thing the train despatcher said to me as I got on my engine was to ask if I understood my orders thoroughly. I answered that I did, that I had the right-of-way over all other trains. He told me to make a good run. I could not have asked for a more important run. With over 950 people on board and with one of the best engines on the road, I read and re-read the orders to be sure that I was right.

What shall be said of the mental attitude of the despatcher who has to thus question an engineman, and of an engineman who has to "read and re-read?" It is common enough among careful men; but does not the fact discredit the system?

Quick-Acting Brakes in Great Britain.

The reports of Col. Yorke, railway inspector for the (British) Board of Trade, are so spirited and interesting that any errors they may contain are, because they are widely read, by so much the more injurious. In the large, he is apt to be right and his bold criticisms and recommendations are nearly if not quite the most powerful single influence over railroad methods. His conclusions and comments, printed in another column, on the Scotch railroad accident where 80 persons were killed or wounded will be read with surprise by most American railroad officers. The engine-driver lost control of his train in entering the Glasgow station, hit the bumper post and telescoped two coaches. The regulations for working the automatic vacuum brake require the drivers to enter stations "at such a speed as to enable them to stop the train at the proper place by the application of the hand brake only, and guards must watch the speed of the trains and assist the engine-drivers by the use of the hand brake when necessary."

The wording of this rule according to our standards is subject to criticism. The automatic brake has been in service in England for about a quarter of a century. It has long been in exclusive use on passenger trains there and it is not at all presumable that locomotive drivers of the present day have anything like accurate knowledge of the stopping ability of the "hand brake only." It would seem as if this rule should be given to the engine driver in terms of speed. The rule is also hazy in directing guards to use the hand brake "when necessary." But worse than these minor objections is the vital one that it seems to involve a double and a divided responsibility for using two different methods of controlling the train, subversive of discipline according to our notion, and resulting in inaccurate control whenever the guards happen to think of interfering with the work of the engine-driver. It indicates a distrust of the reliability of the automatic brake under the most favorable conditions, a level track and low speed. The following statement by Col. Yorke is a little careless:

> Both the Vacuum Brake Company and the Westinghouse Brake Company have for some years past been able to supply quick-acting brakes, the advantage of which in times of emergency cannot be gainsaid. These improvements, though adopted abroad, have been ignored in the United Kingdom, where, so far as I know, only one railroad company has done anything, even experimentally, toward fitting its passenger stock with a quick-acting pattern of brake.

The North Eastern railway, to which Col. Yorke refers, is far beyond the experimental stage in the use of modern brakes. It has 4,185 cars fitted with the Westinghouse automatic, and of these 1,376 are quick-acting. This company made its "experiments" with the quick-acting brake long ago and ordered all their passenger cars, as they pass through the shop for brake repairs, fitted with the most modern form of Westinghouse quick-acting brake, with the result that one-third of them are already so equipped and that within a short period all the passenger train cars for which the quick action is suitable will be equipped with that brake.

There were, at the beginning of this year, in Great Britain 51,664 cars equipped with the vacuum brake

and 21,624 cars with the Westinghouse brake. We have no information as to the number of these Westinghouse brakes which are quick-acting, except so far as above stated for the North Eastern. There is also lacking data as to how far the Vacuum company has developed and introduced quick action, but it is not likely that they have done much.

When the quick-acting brake was introduced in this country the limit of the rapidity of its adoption was simply the limit of the capacity of the manufacturers to supply it and the ability of the railroad companies to pay for it. Its safety and its economy were beyond question, and at first thought it seems surprising that it should not have been so substituted rapidly on those British roads which used the compressed air-brake. There is, however, a marked difference of condition which explains it if it does not justify it. Substantially all the railroads of Great Britain are block signaled, and this, together with their generally more favorable alinement and curvature has given them a, to us, wonderful immunity from collisions. The money cost of life and property destroyed by butting and rear end collisions on British roads is insignificant as compared with our losses under more difficult conditions. This is suggested simply as an explanation for the partial lack of incentive to the use of the quick acting brake in Great Britain. Here, the difference between the most efficient possible brake and a good serviceable brake which will control the train for ordinary stops is enormous. It is too frequently the difference between safety and a severe loss of life and property.

There is still another development of the automatic brake to which Colonel Yorke does not refer and which has been shown only experimentally in England, and that is the high speed brake. This has been practical and serviceable in this country for a very short time. Nevertheless, in that short time—a year or so—the Westinghouse Company has equipped 17,000 cars, and it may be said generally that no railroad officer in this country feels safe in running high speed trains without the high speed brake.

The time has come for a reconsideration of the brake question in this country. I do not now refer to the dual system which unfortunately exists, some companies having the vacuum and some the Westinghouse, though this is all important, and will have to be faced if freight trains are to be fitted with continuous brakes. But I refer to the fact that the brakes employed on the passenger rolling stock in the United Kingdom, whether they belong to the vacuum class or to the Westinghouse class, are not of the most modern description.

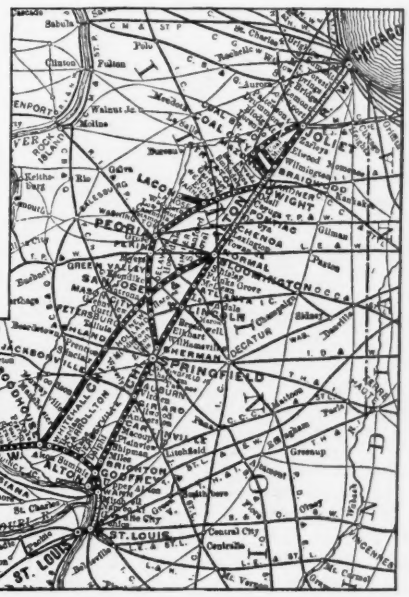
We hope it is true that it will develop that Colonel Yorke has done an important service by the bold stand which he has taken, but we imagine that in whatever success he may have it will be with the result of introducing the very latest development of the art—the high speed brake.

Another chapter or two has been added to the checkered history of the Blackwell's Island bridge over the East River, New York City. After the rejection of the single bid submitted on September 24, Bridge Commissioner Lindenthal modified the specifications slightly and advertised a second time for bids. The one important change which was made in the specifications was the insertion of a strike clause, exempting the contractor from penalties for non-completion within the specified time in case of strikes of workmen on the bridge. The bids were opened for the second time on November 5. Two tenders were received, one from the Pennsylvania Steel Co., which submitted the only bid on the first advertisement, and one from Milliken Bros., Brooklyn, N. Y. The readjusted bid of the former was $5,132,985, about $122,500 less than its first bid of $5,255,514, and the bid of the Brooklyn contractors was $5,188,850. The detail prices per pound for the different classes of material in the bid of the Pennsylvania Steel Co. were as follows: Nickel steel eyebars, 8.03 cents; nickel steel pins, 10.03; structural steel eyebars, 6.52; structural steel pins, 8.39; other structural steel, 5.64; steel castings, 9.01. Both of the bids were more than a million and a half dollars over the estimate. In the meantime the Bridge Commissioner was served with an order to appear in court on November 10 and show cause why an injunction should not be issued restraining him from awarding the contract. The injunction was sought in the name of a taxpayer of Flushing, L. I., who claimed that the Board of Aldermen had never approved the plans of the present Commissioner and hence that the bidding was contrary to law. It was further claimed that the only legal plans for the bridge are those which were prepared under Commissioner Shea, who preceded Mr. Lindenthal in office. Objection was also raised to the insertion of the strike clause. In order to prevent any further delay and acting on the advice of the Corporation Counsel, that an order to show cause did not constitute a stay or temporary injunction, Commissioner Lindenthal formally awarded the contract to the Pennsylvania Steel Co., as the lowest bidder. When the case came up in court, Justice Clarke ruled the case out, but requested both sides to submit briefs on the points of law involved. This may mean a long drawn out legal controversy in case suit to set aside the contract is instituted. There is possible ground for questioning the legality of the Commissioner's acts because of the change in plans. The original plans and estimates drawn up under Commissioner Shea were for a bridge 120 ft. wide using structural steel throughout, and the present plans call for a bridge 90 feet wide, with nickel steel eyebars for top chords. The estimate for the superstructure made on the old plans was $4,350,000, and this was formally approved by the Board of Aldermen, November 8, 1900. The ordinance passed gave the Comptroller the right to issue corporate stock of the city to that amount to pay for the work. The revised plans were never submitted to the Council, as the estimates were lower than the amounts already authorized and the ordinance was thought to cover any modifications which had been made.

The Farmers' Association, also called the "Farmers' Alliance," of Connecticut, has revived itself in a fashion somewhat disturbing to railroad interests as well as to politics in that State. The last Legislature contained in the lower house 90 farmers out of a total membership of 255. These farmers, practically having a veto on positive legislation and a very strong factor in lawmaking of all kinds, banded together as an "association," having a chairman, meeting once a week and passing on various measures before the General Assembly. The Association stood behind the semi-socialistic measure—which became a law—for partial payment by the State of certain old "town aid" debts incurred for railroads; defeated the New Haven Railroad Company's bills to modify the car detention law, and to repeal the general State railroad act; and, as a policy supported the idea of liberal legislation for cross-country trolleys to "help out" the farms—trolleys of which a large number in the State have reached the "blue print" stage and stopped there. The association is now reaching out beyond the State House. It has held a meeting, appointed a committee of three from each county for organization and advice, and evidently plans a systematic "farm movement" in State affairs. As the possible germ of a granger party, with acute relations to the railroads, in a State where, under a peculiar constitution, the farm towns all but dominate legislation, the future of the association has more than passing interest even though its activities, as in the case of the old granger parties at the west, extend through but a few years.

Chicago & Alton.

The organization of the Chicago & Alton Railway Company in 1900 to take over the stock of the old Chicago & Alton Railroad, and also to buy a road known as the St. Louis, Peoria & Northern, 57 miles long, which proposed to complete a new through line between St. Louis and Chicago by northerly and southerly extensions, and which would have seriously hurt the Alton, is now familiar history. For several years prior to the change the business of the road had remained stationary or fallen off, but each year under the new management has shown increasing gains. Last year for the first time gross receipts of over $10,000 per mile of road were earned, as compared with $7,766 in 1899. This year a trifle over $11,000 was earned and total gross receipts for the first time passed the ten million mark. The characteristic feature of Alton operations is that there has been little or no main line extension and that the rapidly increasing earnings have therefore showed immediately in traffic density. Ton miles per mile of road amounted this year to 1,204,698, an increase of nearly 23 per cent. from last year, and passenger miles per mile of road were 160,424, an incease of 6.45 per cent. Ton miles per mile increased 20.65 per cent. in 1901 over 1900, and nearly 10 per cent. in 1902 over 1901, so that in three years the freight business per mile has increased from about 630 million ton miles to over 1,100 million.



Chicago & Alton.

The extensive improvement work which was begun by the new management is now well in hand. In the report for 1901 a detailed statement was made of the results which had been accomplished since 1899, including grade and alinement changes with a view to a 16 ft. maximum grade against traffic between Bloomington and Chicago as against the former maximum of 37 ft. per mile, a 26 ft. grade between Springfield and Bloomington as against the previous maximum of 48, and a 42 ft. graue between Slater and Bloomington as against the previous maximum of 52 ft. The grade changes between Bloomington and Chicago were completed in 1902, and other betterment work including additional yards and sidings, replacement of light bridges and wooden trestles with steel spans on concrete foundations, etc., has been pushed vigorously, although no large improvements on grade or alinement were made during the past year. The total expenditure for maintenance of way and structure was $1,325 per mile this year, a considerable increase over previous years, and at the present time considerably over half of the main track is laid with 80-lb. rail, and most of the remainder is laid with 70 or 75-lb. rail.

Gross earnings from all sources amounted this year to $10,071,092, as against $9,225,739 last year. Freight earnings contributed $6,610,637, an increase of over $483,000, although a loss of $877,323 was occasioned by decreased freight rates, the favorable balance having been created by $1,360,456 in increased tonnage. Coal, iron and steel, and other manufactures, animals and animal products, and grain, constituted the chief traffic gains of the year, the increase in grain amounting to over 47 per cent. from the year previous. It is interesting to see that passenger earnings, due in part to an increase in average rate obtained, gained considerably faster in proportion than freight earnings did, and that these earnings are now equal in amount to about 44 per cent. of the earnings from freight, a showing which it may be safely said is not equaled by any other road in the country not built primarily for passenger business, such as the New Haven, or the Long Island.

Increased efficiency of operation, due in part to the betterments which have been made to the roadway, and in part to heavier equipment, is reflected in the very large gains which have been made possible in loading trains. The average train load as recently as 1898 was 187 tons (including company's freight), while for the year ended June 30 last, it was 387 tons, and the revenue load was 361. The following table shows the changes in revenue freight train load since 1900:

Year.	Av. tons rev. freight.	Year.	Av. tons rev. freight.
1900	232	1902	316
1901	288	1903	361

It was pointed out in the report last year that 93 new locomotives, representing over 45 per cent. of the entire equipment, and 4,230 new freight cars, amounting to 44 per cent. of the total, had been put in service since 1899, in addition to changes in passenger equipment. This year, 11 more locomotives were added, mostly consolidations, representing a total tractive power of 470,697 lbs. During the last four years, the total tractive power of the locomotives in service has been increased from 2,874,520 lbs. to 5,181,738 lbs., or 80.27 per cent., and the total capacity of freight equipment from 131,890 tons to 309,180 tons, or 134.42 per cent., and the average capacity of a car has gone from 21½ tons to 31½ tons.

Statistics of operation follow:

	Gross receipts.	Receipts per mile of road.	Passengers, one mile.*	Tons, one mile.*
1899	$6,546,590	$7,766	105,873	519,191
1900	7,796,450	9,119	120,360	629,994
1901	9,036,656	9,826	132,887	823,069
1902	9,225,739	10,032	138,591	902,745
1903	10,071,092	11,002	146,853	1,102,792

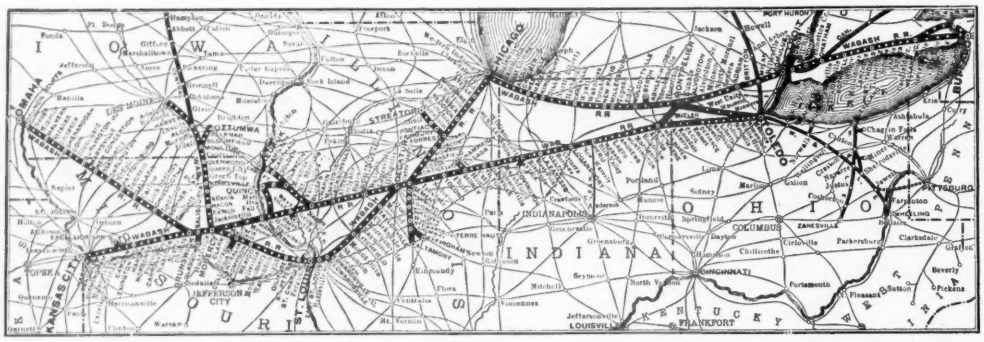
* 000 omitted.

	1903.	1902.
Operating expenses	$6,625,196	$6,023,919
Net earnings	3,445,897	3,201,820
Income from investments	1,770,071	1,528,139
Total income	5,215,967	4,729,959
Total charges†	4,364,927	3,904,618
Surplus applicable for dividend	851,040	825,341
4 per cent. on preferred stock	781,760	781,760
Total surplus	569,438	500,157

† Chiefly rental paid for Chicago & Alton Railroad.

Wabash.

The report of this company for the fiscal year to June 30 shows a continuation of the large increases in freight and passenger traffic and in gross earnings. The increase in net earnings is small, as the company continues its established policy of spending liberal sums for improving the physical condition of the road, so as to bring it to the highest point of operating efficiency. Gross earnings increased $2,087,336 as compared with an increase of $1,499,028 in 1902, on a slightly smaller mileage. Gross earnings per mile were $8,513 against $7,815 in 1902, and net earnings were $2,144 per mile against $2,135. The number of tons of freight moved one mile increased from 1,947 millions to 2,198 millions, while passenger mileage increased about 18 millions. The increase in ton mileage was due, in large part, to an increase in corn traffic, the shipments being 756,765 tons against 559,723 tons in 1902.



Wabash.

Operating expenses increased $1,968,226, owing to the higher cost of labor and fuel, and also to heavy repairs and renewals of bridges. Of this increase, $728,527 was in maintenance of way and structures, which item is 26.81 per cent. higher than last year. The total amount expended for maintenance of way and structures was $3,700,962, or $1,490 per mile of road operated. A large part of this expenditure was on the Buffalo Division, which is operated jointly by the Grand Trunk and the Wabash, where a sum of $304,435 was spent for new steel bridges. This sum represents the Wabash system's proportionate share of the cost of maintenance on this division. The new improvements on the Buffalo Division will enable the use of heavier engines, longer freight trains and faster passenger trains. This constant physical improvement of the road and the provision of additional facilities for handling the great increase in freight, which has been nearly doubled in the past six years, has necessitated constant heavy charges against the maintenance accounts. To improve the terminal facilities at Chicago, St. Louis, Toledo, Detroit and Kansas City, a terminal bond issue of $10,000,000 has been decided upon, of which $4,000,000 will be issued at once for immediate requirements. As the improved terminals will at once increase the earning capacity of the road, more than enough to balance the fixed charges on the bond issue, the issue of the bonds will hasten instead of delay the time when the holders of the debentures and stock of the company will receive dividends.

The income account shows a surplus, over fixed charges and a 6 per cent. dividend on the debenture A bonds, of $196,150, as against $201,460 in 1902. This small surplus is caused not only by heavy expenditures in maintenance but also by the fact that sums of $253,132 and of $564,157 were deducted from income for extraordinary additions to property and for sinking fund charges.

One of the most gratifying gains in the report is the increase in the revenue trainload from 284 tons in 1902, to 301 tons in the present year, an increase of 6 per cent. This item has shown steady gains since 1895, when the load was only 176 tons, showing the good results of the heavy outlays that have been made for the improvement of the operating efficiency of the road. Including the company's freight, the trainload during the last year was 331 tons against 316 tons in 1902.

The leading operating statistics follow:

	1903.	1902.
Average miles worked	2,483	2,438
Freight earnings	$13,327,479	$11,763,541
Passenger earnings	6,135,501	5,780,241
Gross earnings	21,140,829	19,053,493
Operating expenses	15,815,662	13,847,436
Net earnings	5,325,167	5,206,057
Per cent. expenses	74.81	72.68
Surplus	$196,150	$201,460

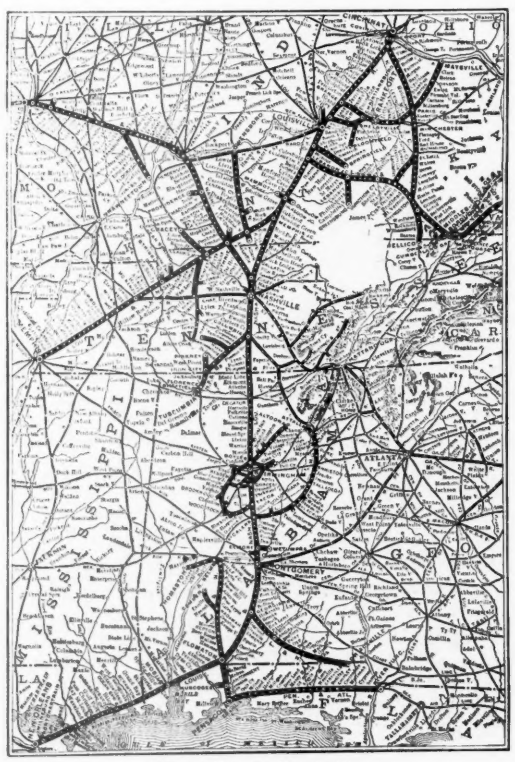
Louisville & Nashville.

The increase in the gross earnings of this company during the past decade constitutes quite a remarkable traffic expansion. From the year 1893 up to the present fiscal year, over an increased mileage of 683 miles, gross earnings have increased from $18,974,337 to $35,449,377, and net earnings from $7,110,552 to $11,478,565. Not only is the increase of $4,737,120 in gross earnings for the fiscal year nearly double that of the previous year, but a gain of $1,668,746 is carried over into net as compared with a gain of only $20,646 in 1902. Freight earnings increased from $22,772,175 to $26,578,620, and passenger earnings from $6,217,802 to $7,044,087. This large gain in net earnings does not indicate any slackening of improvements, for of the total maintenance charges of $10,664,234, the report states that $2,000,204 was for additional improvements and additions to property and for equipment, this item comparing with $1,487,277 expended for similar purposes in the previous year. The rule of charging all expenditures for roadway betterments directly to operating expenses was adopted in 1894, and a summary of these charges is given in the report. Of the $2,000,204 improvement charges this year, $547,848 was for equipment. During the year the company added 20 locomotives, 20 passenger coaches and 4,386 freight cars to its equipment. To pay for these, $1,577,465 was charged to capital account, and the remainder, $1,225,809, was charged to the reserve rolling stock fund.

Of the roadway improvements charged to operating expenses, the cost of ballasting, new sidings and new buildings amounted to $743,158. These expenditures were for the line directly owned and operated, as the betterment work on the roads of the various subsidiary companies was charged against their separate accounts.

Although the company is interested in 6,133 miles of road, the average number of miles operated is only 3,439, but this is an increase of 112 miles over the previous year. Notwithstanding this increase in mileage, gross earnings per mile rose from $9,332 to $10,308, and net earnings per mile from $2,949 to $3,338. The decrease in the ratio of operating expenses to earnings from 68.06 to 67.62, shows that a higher operating efficiency is gradually being attained. Revenue ton mileage increased 3½ million units. A slight increase in the average trainload to 231½ tons, with an improvement in the average ton-mile revenue from 7.41 mills to 7.79 mills, has enabled the company to show earnings per freight train mile of $1.80 against $1.71 in 1902.

The funded debt was increased during the year by the issue of $30,000,000 five-twenty collateral trust 4 per cent. gold bonds. The proceeds from the sale of these bonds were used to redeem $6,981,000 Louisville & Nashville five-twenty collateral trust 4 per cent. gold bonds dated 1898; to retire a floating debt of $4,000,000 created by the purchase of the Atlanta, Knoxville & Georgia, and



Louisville & Nashville.

by the maturing of $1,996,660 Memphis, Clarksville & Louisville sterling 6 per cent. mortgage bonds; to provide a fund of $3,160,000 for the South & North Alabama with which to pay off the Memphis, C. & L.'s mortgoge bonds maturing May 1, 1903; and to pay for additions, improvements and new equipment, authorized by the directors.

After payment of all fixed charges, and an expenditure of over two million dollars for improvements, charged to operating expenses, the surplus available for dividends was $6,211,048. Deducting the regular 5 per cent. dividend of $3,000,000 on the $60,000,000 outstanding stock of the company, there is still left a sum equal to an extra dividend of 5 per cent. This makes a total of 10 per cent. earned on the stock during the year. Statistics of operation follow:

	1903.	1902.
Average mileage worked	3,439	3,327
Passenger earnings	$7,044,087	$6,217,803
Freight earnings	26,578,621	22,772,176
Gross earnings	35,449,378	30,712,257
Operating expenses	23,970,812	20,902,438
Total income	12,601,058	10,810,841
Fixed charges, taxes, rentals	6,390,011	6,085,534
Balance applicable for dividend	6,211,047	4,725,307
Dividend (5 per cent.)	3,000,000	2,875,000
Surplus for year	3,211,047	1,850,307

NEW PUBLICATIONS.

Proceedings of the Thirty-seventh Annual Convention of the Master Car Builders' Association, held at Saratoga in 1903. Chicago (The Rookery): J. W. Taylor, Secretary, 1902.

This volume is the largest ever published by the Association and contains 620 pages of text with a large number of plates. It contains a complete report of the convention, including the full text of the committee reports and the topical discussions, the Rules of Interchange as revised, decisions of the Arbitration Committee, standards and recommended practice as revised by letter ballot since the convention, and a full list of officers, members and committees for the coming year. This book is so familiar to our readers that an analytical review would be superfluous. In every way it is similar to the volumes previously issued.

Proceedings of the Thirty-sixth Annual Convention of the American Railway Master Mechanics' Association, held at Saratoga in 1903. Chicago (The Rookery): J. W. Taylor, Secretary, 1902.

The Proceedings for this year contains 457 pages, a trifle more than last year, which was the largest ever issued. The volume contains a full report of the convention at Saratoga last June, and, as in previous years, a number of plates showing the latest revised standards of the Association together with the explanatory text. The usual complete index, lists of officers, committees, and members and all of the reports and discussions are given in full. In size and binding it is companion to the volumes issued in past years.

TRADE CATALOGUES.

Buffalo Forge Co., Buffalo, N. Y., has issued an attractively bound and printed book of 120 pages on Mechanical Draft which contains a great deal of interesting reading and much valuable information on boiler plants, stacks and combustion of various kinds of fuel. The Buffalo Forge Co. makes both the induced and forced draft systems or a combination of the two with separate fans. The latter system has been used for burning powdered coal in suspension with complete success. The chief advantages of any mechanical draft system are the saving in first cost over a tall stack, the better opportunity of utilizing the heat of the gases in economizers and the freedom from the effects of atmospheric conditions which often impair the efficiency of the tall stack. The book is a valuable one for reference aside from the fact that it contains a description of the principal forms of apparatus made by the company.

Brown Hoisting Machinery Co., Cleveland, Ohio, which makes hoisting and unloading machinery for all purposes, has issued from time to time pamphlets describing the various classes of hoists and cranes built for different kinds of service. In Pamphlet 1 a number of types of locomotive cranes of all capacities are illustrated and described. These cranes may be used for all kinds of lifting and transporting of heavy castings, logs, steel work, stones and loose earth and ore when equipped with hoisting bucket. They are made with capacities from three tons to 20 tons, with a radius of from 10 to 40 ft., to run on any gage track specified. Contractors, industrial works, plantations and railroads find them an economical means of handling any heavy or bulky material.

Nernst Lamp Co., Pittsburg, Pa., which makes the Nernst lamp, now being largely used in place of incandescent and arc lamps for interior and exterior lighting, has prepared a handsomely illustrated pamphlet explaining the principle of the glower lamp and giving some useful information about its care and operation. The quality and steadiness of the light and the high efficiency of the lamp make this system of illumination particularly advantageous for large office buildings, shops and stores.

How the World's Money is Made is the title of an interesting and artistic small book written by Henry P. Dickinson, Metallurgist, Tacoma Building, Chicago. A brief illustrated description is given of the development of a gold mine from the time the prospector locates a claim up to the time the metal is shipped to the mint. The story is written well and has the additional value of being correct in technical details.

Portable Forges is the title of a little pamphlet of the Buffalo Forge Co., Buffalo, N. Y., which gives illustra-

tions, descriptions and price lists of the large number of designs of blacksmiths' and ironworkers' heating and rivet forges which that company makes. Miscellaneous smith's tools, hand shears, punches, bracket drills and like machines are also briefly mentioned.

The Franklin Rubber Mfg. Co., New York City, has published a small catalogue of the numerous rubber specialties which it makes, including air and steam hose, rubber packing and gaskets, perforated and embossed floor mats, safety treads and other rubber goods used on railroads.

Tandem-Compound Express Locomotives for the Russian Empire Railways.

The illustrations show the standard express locomotive of the St. Petersburg-Warsaw section of the Russian State Railways. They are tandem-compounds, a system little used in Europe, and are designed to haul loads of 270 (long) tons net up grades of 1 in 125 at an average speed of 32 m.p.h., and to descend the same grade with the same load at 62½ m.p.h. They have proved their ability to do much more in service, as in trials they have covered the distance between St. Petersburg and Pskow —171 miles—in 3 h. 31 min., or at about 48½ m.p.h. In these runs the maximum speed was kept below 68½ m.p.h. The train consisted of 10 large double-bogie broad-gage coaches, the total load including the locomotive being 363 tons.

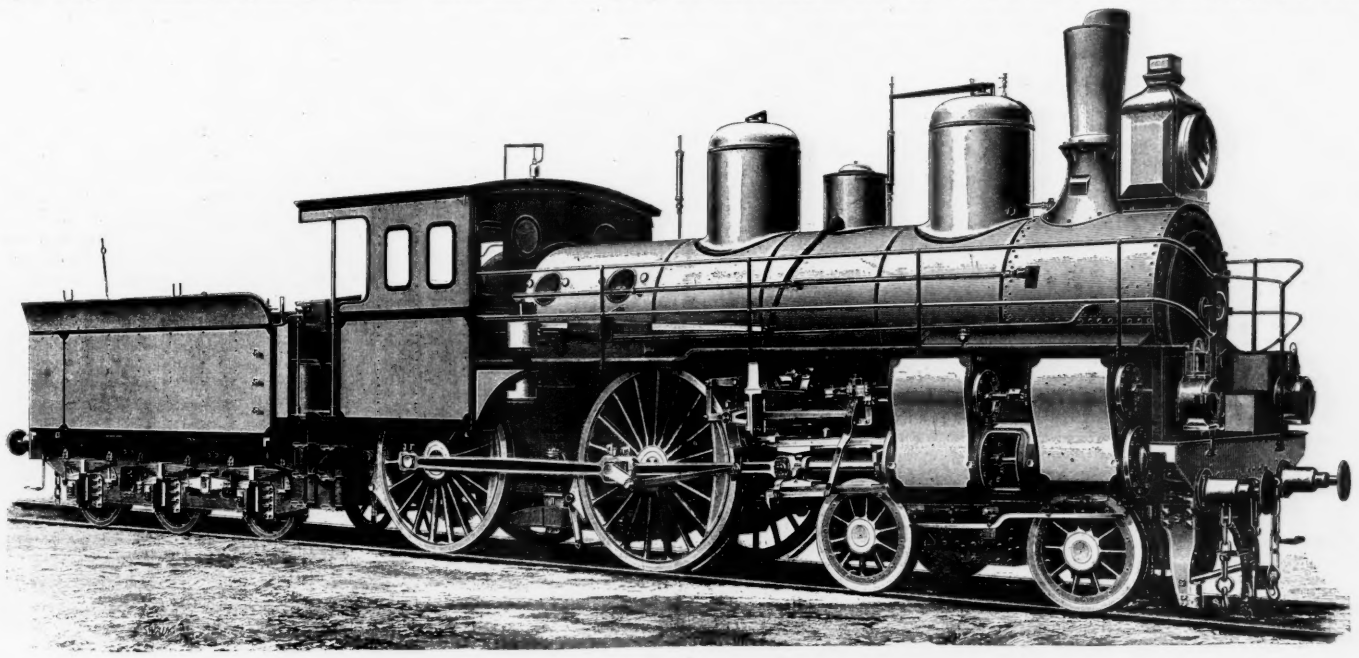
Although the wheel arrangement corresponds to the eight-wheel or American type, it will be observed that the truck extends much further back than in the similar American arrangement. This is to enable it to relieve the driving wheels of a part of the weight which would otherwise exceed the prescribed limit for wheel loads in Continental practice.

The width of gage permits the boiler to be set low, the height of its center above the rail being 2,494 m.m. (about 8 ft. 2 in.). Two high steam domes are provided, adding considerably to the steam space of the boiler with practically no increase in weight. The boiler is made of 5/8-in. iron plates and has an inside diameter of 4 ft. 6¾ in. at the front ring. The smallest ring, however, is in the middle of the barrel. There are 216 tubes, 2 in. outside diameter, and 12 ft. 10 in. long. The total heating surface is 1,572 sq. ft., of which 147 sq. ft. or nearly 10 per cent., is in the fire-box. The working pressure is 191 lbs.

The cylinder dimensions are 14⅜ and 21½ in. diameter by 24 in. stroke. Piston valves are used for both high and low-pressure cylinders. They are 8⅝ in. in diameter and give external admission. Between the two valve-stems of each group is a screw buckle, with lock for adjusting the valves. Each group of tandem cylinders is cast in one piece.

The side frames are $1^3/_{16}$ in. thick and at the fire-box end are 3 ft. 4 in. deep. Holes are drilled in them opposite the fire-box staybolts. The cab fittings are simple in form and few in number. The cab is roomy and has large front windows, as in American practice.

The illustrations and information are from *The Engineer*, London.



Tandem-Compound Express Locomotive of the Russian Empire Railways.

The Transmitting Typewriter at the Telegraphers' Tournament.

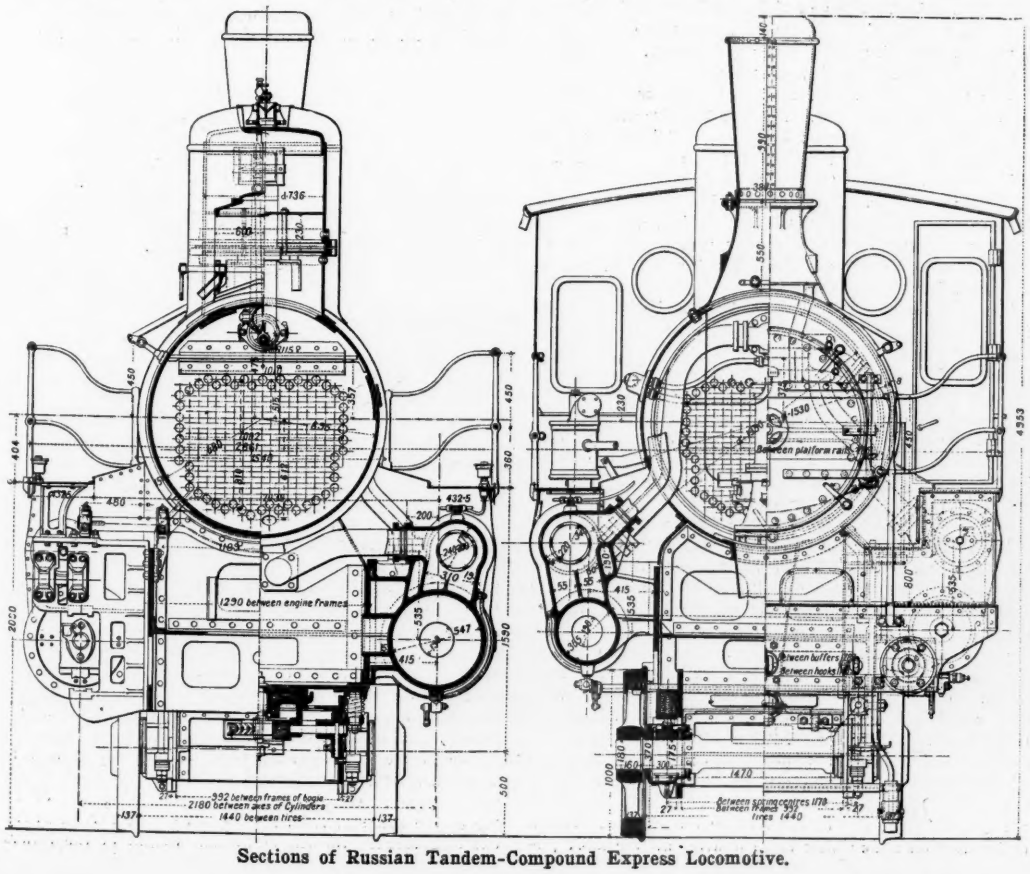
At the tournament held in Philadelphia Oct. 30 and 31 under the auspices of the American Telegraphers' Tournament Association a new departure in sending and receiving Morse signals was introduced in the form of a transmitting typewriter.

The Yetman transmitting typewriter for the first time applies the "keyboard" principle of the typewriter and the linotype to telegraphy and with the same success which attended the introduction of those very useful machines. By the adoption of the "keyboard" idea the operator equalizes his effort to both arms, both hands and all the fingers. For example, the letter p, five dots, is sent by the depression of a single key, once, as in making a letter on any ordinary typewriter. The value of this is in the perfect accuracy secured. A great fault of telegraph operators is slovenly sending.

The seventh event was divided into two classes, class A for sending 500 words straight press matter, and Class B for receiving messages on the typewriter, 15 minute trials, automatic transmission. First prize in both classes $50 and one Yetman transmitter. Class A was won by A. P. West, of the Postal, New York, on a Yetman transmitter. Class B was won by J. P. Gallagher, of the Postal, New York, on a Yetman transmitter.

The ninth event was the most important and, as it proved, the most interesting on the programme. It was for receiving messages on any style of typewriter, 30 minute trials, transmission to be made by the Yetman transmitter. The first prize in this event, $200, was won by J. P. Gallagher, of the Postal, New York, on a transmitting typewriter. In both the seventh and ninth events Mr. Gallagher was opposed to former message-receiving champion Harry V. Emmanuel, who operated a Fay-Sholes.

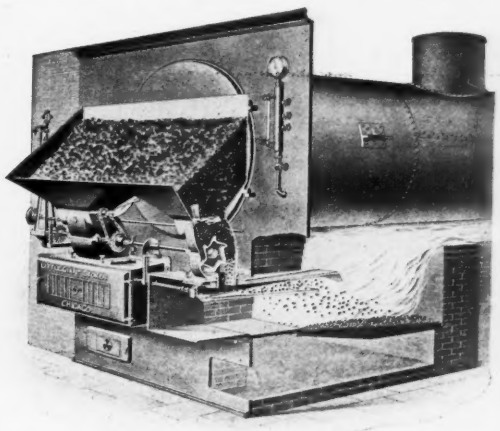
The sending for the ninth event was done by Geo. W. Conkling, and the enthusiasm of the audience was wrought to the highest pitch when it was learned that Mr. Conkling had broken the world's record for this class of work, having sent 53 messages in 30 minutes time. The wires had been cut through to New York and Chicago on this occasion. Manager Whalen, of the Postal, says that every dot went through and that the whole work was the most beautiful he had ever seen.



Sections of Russian Tandem-Compound Express Locomotive.

The Little Giant Stoker.

The Chicago Pneumatic Tool Company makes an automatic stoker of a new design. The fuel is dumped into large hoppers either by hand in a small plant or by means of an overhead traveler where there is a battery of boilers. From the hoppers the coal passes over a revolving cog wheel, the rate of rotation of this wheel regulating the quantity of fuel fed to the grates. After passing this wheel the coal falls into a slowly oscillating spreader or chute, and is forced through this by means of a steam jet, the coal falling in a thin stream over



Little Giant Automatic Stoker.

the grate. The movement of the spreader in swinging slowly backward and forward distributes the coal in such a manner as to cover all portions of the grate with a fire of equal intensity.

This stoker can be attached to the boiler without drawing the fire and no alteration in the boiler front is required. It is said that the stoker can be attached to the boiler in about eight hours and it can be removed in about one hour. The cheapest grades of fuel may be used in any size from that which will pass a 1¼ in. mesh screen to the smallest size slack.

A new factory devoted exclusively to making these stokers has been built in Chicago.

The Armington Electric Hoist.

This electric hoist is designed for a special trolley suspension and is useful where cranes of the three motor type cannot be installed. The hoist occupies but a small space but will handle heavy loads quickly and economically.

All journals have bronze bearings bored in place, thus giving accurate alinement. No differential or worm gear-

Armington Electric Hoist.

ing is used. All gears are spur gears cut from solid blanks with large pitch. A series wound, multi-polar crane motor is used with a face plate type, fire-proof controller. The controller lever is so arranged that the circuit opens and remains open automatically unless the controller rope is in the hands of the operator. The load is entirely sustained by an automatic safety brake. In descending, the load moves only as long as the operator pulls the rope. If the operator suddenly leaves the machine the motor stops automatically and the load is held by the brake. The hook is well proportioned, forged of steel, and is made to swivel.

The hoist is made in several different forms by the Cleveland Crane & Car Company, Wickliffe, Ohio. The company also makes a complete line of traveling and jib cranes.

Arctic Railroading.

BY A. S. ATKINSON.

Old-time railroad engineers who first crossed the continent found plenty of engineering difficulties to overcome, but it is doubtful if they ever experienced quite such obstacles as those encountered by the railroad men now working to conquer the Arctic regions. The building of snow sheds and cuts, and the eternal fight with blizzards with the old-time bucking snow plows or the modern rotaries, always furnished picturesque work for the railroad crews, and there is enough excitement to-day in this line to satisfy most men. But railroading in the Arctic circle is altogether different. Conditions are intensified there tenfold, sometimes a hundred, and what a pioneer western railroad builder met with twenty and thirty years ago in trying to connect the two oceans is slight in comparison.

Very few people realize the great cost and difficulty of transportation in northern Alaska. The need of railroads is urgent. The white man's burden is indeed hard in the Arctic circle without his railroad. He often becomes his own carrier, and tramps for miles through snow and drifts to secure a few of the necessaries of life. He risks life and happiness to purchase the tobacco which consoles him in the evening after his daily toil, and he labors over almost impassable passes for the privilege of paying tremendous prices for clothes, whisky, sugar and salt.

Alaska is really a fertile region, and railroad companies are realizing that it needs better transportation facilities to develop it and attract people to the interior. Thousands of people have been going north to Alaska not simply to dig for gold, and then return, but to locate there permanently. In spite of hardships, a rigorous climate, and many other disadvantages, there is something attractive about life under the Arctic circle, and tens of thousands of people live there, and their ranks are being recruited by others every year. Since the first railroad was built there, the influx has been materially increased, and the railroads have had ample transportation trade. In summer time the climate of Alaska is delightful, and many grains and fruits can be raised in the broad valleys successfully. During this season the railroads are overworked. There is no snow or blizzards to interfere with the traffic, and everything runs along smoothly. The season is usually dry, so that little difficulty is experienced from washouts and floods. Barley, oats and buckwheat have become quite important crops, and thousands of bushels of these grains are now transported south to the coast from the great interior plains. In time it may be that Alaska will form the key to an overland route to Europe and Asia via the Bering Sea. In that event the railroad system which first secures the control of the easiest and most direct route will be amply repaid for the pioneer work.

The brief history of the White Pass & Yukon shows forcibly the commercial value a railroad confers upon any territory. The White Pass & Yukon runs southward from Dawson City to the coast at Skagway. It is 112 miles long, and cost upward of $3,000,000. Before this road was built freight was carried across the pass on men's backs at a cost of 50c. to $1 per pound; but since the road was finished, the transportation charges have averaged less than five cents a pound. The population has increased as a result of the road's operation, so that nearly ten times as much freight is carried now than before its construction and equipment.

Railroading in the Arctic circle is not unpleasant in the summer season, but as winter comes on danger and hardship threatens. There are days and weeks when the roads are tied up entirely. Blizzards and storms of such severity that no man can face them sweep down the Yukon Pass, and obliterate the trail of man. Yet in some respects the railroad men have accomplished more wonderful engineering feats under the Arctic sun than in the northwest of our own country. Ice, snow and cold are the foes to fight. To overcome these snow sheds, tunnels, and slides have been built to keep the tracks free from obstructions. The building of these on the sides of snow mountains with precipitous descent is not a simple matter. Old railroad men have lost their lives in trying to hang a single track on a ridge of rock 6 ft. wide, and others have quietly sat down in the snow and frozen to death while waiting for the relief party to come after the blizzard.

It must be remembered that Alaska is an enormous country, almost as large as all of the States east of the Mississippi river. It has extensive habitable portions, and large tracts that can never be used for anything. On the western coast there are three important peninsulas, which in time will become more or less gridironed with railroads. The Seward peninsula, which is central and juts far out into Bering strait, and nearly reaches Russian Siberia, contains Cape Nome and a rich, fertile territory. Railroad building on this peninsula will be a scene of considerable activity in the coming year. The new road called the Council City & Solomon River Railroad, or the North Star line, will be the farthest north railroad yet built on this continent. It will connect with the coast the great inland gold fields around Nome. At present ships discharging their cargoes at Cape Nome have to lighter them ashore in a most disagreeable sea and under conditions very threatening; but the Solomon river, 36 miles east of Nome with its population of 20,000, offers a safe harbor for small boats. A small railroad known as the "Wild Goose Railroad" connects Nome with Anvil Creek, and this in the past has helped to lessen the difficulties of landing cargoes from the steamers without accident. The new Solomon River Railroad will, however, greatly simplify matters, and make it possible for cargo to reach a safe harbor at less cost, and then be transported to its inland destination.

The new railroad will run through a comparatively level part of the country, following the river throughout a good part of its course; but there will be many engineering difficulties that will test the resources of the builders to their utmost. A part of the work will be carried on all winter. Material is being shipped north to keep the men employed until next spring, and throughout the cold northern winter they will struggle against conditions that never beset the railroad man in the States.

Timber is scarce in this great northern region, and the railroad ties and telegraph poles have to be brought up from the coast lower down. The price of lumber in Nome and Solomon City is $200 to $300 per thousand, and most of this comes from Seattle and Tacoma. Many substitutes for timber are used for house building, while driftwood on the coast is picked up almost as carefully as if it contained some precious mineral. The new railroads being built on the Seward peninsula will tap heavy inland timber regions along the course of the river valley, and this will facilitate the work of building, and also cheapen the cost of finished timber in the cities.

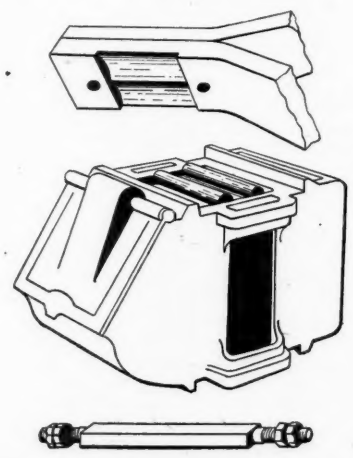
Railroading under the Arctic circle, when the lines are once finished, is not without its excitements and diversions. The snow storms of winter come down upon the country with bewildering suddenness. It is not uncommon to have the trains stalled in snow drifts 40 ft. high for a period of two or three weeks. The question of how the passengers and crew manage to survive such ordeals is not so difficult of solution. The trains carry with them provisions sufficient to withstand ordinary sieges of this nature. The train crew are hardened veterans in fighting snow in the great northern countries. They are expert snow-shoe runners, and in lieu of telegraph messages, they volunteer to travel back to civilization to notify the authorities of the trouble on the line. But a train crew on a wrecking train is after all the most picturesque and venturesome of these northern railroad men. They are called forth to do battle with the most formidable obstacles ever presented to the progress of a train. There are mountains of snow to be cut through, frozen so hard that its icy surface can hardly be dented by a pick-axe. Yet in some way the train-wrecking crews manage to worm their way through to the stalled train. But they dig a tunnel rather than a deep cut through the mountain of snow and ice. This snow tunnel does not dissolve until spring, and serves as a protection in future storms. It is in reality a snow shed which may extend for miles, hewn out of solid snow and ice. It is considered necessary by some engineers in the far north to invent some sort of rapid boring machine, which could cut its way through this hard snow and ice, and thus bore out for the trains each winter tunnels through which they could pass. Once bored for the season, there would be little more trouble from storms to fear. Nearly all of the heavy snow drifts occur at the same points, and these once opened up, the roads would find no further opposition from future storms. A boring machine that could be pushed before a powerful locomotive to open up a snow tunnel at the rate of a mile or two an hour would solve the greatest engineering problem of railroading under the Arctic circle in mid-winter. When it is remembered that the Arctic winter is a long one, it can be readily seen that such a snow tunnel would be useful for seven or eight months out of the year. The danger would come when the snow melted and the roof collapsed.

It is estimated that the cost of building the projected lines on the Seward Peninsula will run from $8,000 to $10,000 per mile; but in many parts of the mountainous regions this cost will be doubled several times. Mills, stores, factories, and restaurants will follow along the lines of the railroads, and prosperous communities and cities may spring up in those cold northern regions as they did when the west and northwest were first opened by the transcontinental roads. Whether Alaska is destined to witness a boom similar to that of the northwest is a question that is variously answered to-day, but many believe her future is promising and fascinating, independent of the discovery of more gold and precious metals.

The Holland Lateral Motion Device for Arch-Bar Trucks.

The engravings show the details of a lateral motion device for arch-bar trucks. The journal box is of special design with elongated slots in the side walls for the journal box bolts and two concave recesses in the top surface in which lie two steel rollers 1 in. in diameter and 6 in. long. Recesses similar in shape and size are milled in the bottom surface of the inverted arch-bar. When the side frames are assembled, the truck rides on these rollers, which give it a short lateral motion of about 1 in. in each direction. The special journal box bolt, shown in the engraving, holds the arch-bars together and also holds the tie-bar away from the bottom of the journal box when the truck is in its normal position. When the rollers rise to the end of their travel, these bolts draw the tie bar up tight against the bottom of the box and the lateral motion is arrested. Stops on the top and bottom of the box also limit the side play. The arch-bars lie close to the top of the box and rise about ⅛ in. with full travel of the rollers.

In applying this device to trucks already built, the rollers and special journal boxes are all that are required. The lateral motion journal box can be put on or taken off in a short time, and as it interchanges with the standard M. C. B. box, no changes in the truck are required. In case of a wreck or breakage, the standard M. C. B. box and bolts can be inserted for temporary use, if special boxes and bolts are not at hand. When necessary, the rollers can be removed and the arch-bars allowed to rest directly on top of the box. The insertion of the rollers makes practically no difference in the height of the truck, so that the standard height of car floor and distance to center line of coupler are preserved.



Holland Lateral Motion Device.

The device is very simple in its application and no strength is sacrificed in applying it. There is practically no increase in weight, since the metal taken out of the top of the box and from the bottom of the inverted arch-bar compensates for the additional weight of the rollers.

There is little wear on the parts and as the contact surface of the rollers is large, the surfaces will not cut or grind.

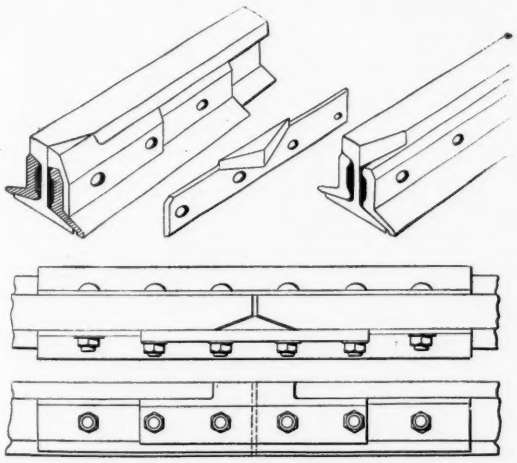
The action of the lateral motion device is apparent. The lurching of the car on entering or leaving a curve causes the side frames to move outward, which movement carries the roller up the inclined surface of the concave recess. This upward movement is resisted by the weight of the car and the blow is absorbed in lifting the whole car. After the blow has been absorbed, the rollers resume their normal position at the bottom of the trough. This device is very similar to the Kindl lateral motion device for pedestal trucks. The patents which have been granted to the Holland Company, of Pittsburg, Pa., cover arch-bar trucks only. The application of the device to the arch-bar trucks is so simple that any railroad company can do the work in its own shops, but the company is prepared to furnish boxes, bolts and rollers, and also do the milling on the arch-bars when so desired.

The Heinle Continuous-Tread Rail Joint.

In the Heinle continuous-tread rail joint, shown in the accompanying engraving, the corresponding rail ends are cut away on a miter to form a triangular recess on the outside of the treads. The miter cut begins at the outer edge of the rail web and extends obliquely to the outside of the rail head, making an angle of 108½ deg. with the rail end. The rail head only is cut away, leaving the end of the flange square. The parts of the rail heads removed by sawing are replaced by a triangular block which fits the recess in the treads and is made integral with, or is carried by, an elongated bar bolted on the outside of the splice bar, as shown in the drawing.

The triangular block assumes the same position in the rail treads as were occupied by the parts that were cut away, and 38 per cent. of the joint opening is thus closed to the wheel tread at all times, making the plane of the rail heads continuous over the opening. The wheel pressure is borne on the leaving rail end until the opening at the joint is reached. The triangular block carries the load over the opening to the receiving rail end with no depression of either rail. The greatest load carried by the triangular block or bar at one time is the concentrated load of one wheel when the wheel is directly over the opening, and this load is equally distributed over the head and the bottom flange of the splice bar.

The triangular bar is made as a separate piece to allow it to take a position in the triangular recess in the rail independent of the movement of the main splice bars. This permits the expansion and contraction of the rails and prevents any difficulty in keeping the track in alinement. It is also cheaper to manufacture the triangular bar as a separate piece and facilitates its application to the joint. No changes in the other standards of track joints are necessary and the usual form of rail and fish-



Heinle Continuous-Tread Rail Joint.

plate may be used. The triangular bar is rolled in the usual way and is cut and punched like the ordinary splice bar. The bevel on the rail end is cut in the same way and on the same machines as the square cut is made.

With the ordinary fish-plate joint, the hammer of the wheels in passing over the open joint destroys the binding of the joint and wears down the bearing surfaces of the splice bars. The rails soon take a permanent deflection, and when relaid the battered-down ends must be cut off well back before the rails can be used again. The Heinle continuous joint carries the wheel load past the joint-opening on a separate rail head independent of the rail section. The vertical stresses are thus alternately thrown from the rail to the triangular block and back again to the rail as the wheel passes over the opening. This action prevents the elastic deflection of the rail ends and eases the pound of the wheels in passing over the joint to such an extent that permanent deflection does not take place. The continuous-tread joint is particularly valuable when applied to elevated railroad structures and long bridge spans. The enormous sudden stresses due to the pounding of the wheels over the open joints are relieved and the maintenance cost is much reduced. It can be used with the 60-ft. rail lengths where the expansion space between the rails is necessarily large and where the hammer-blow effects of the wheels are much greater.

The triangular bar is not on the gage side of the rail and is therefore not subjected to the wear of the wheel flanges. By reducing the vibration at the joint it has been found unnecessary to use nut locks. The cost of equipping one mile of track with these joints is less than $100. Messrs. A. G. and A. W. Heinle, Crafton, Pittsburg, Pa., are the inventors of the device.

TECHNICAL.

Manufacturing and Business.

The Kennicott Water Softening Company has opened an office at 29 Great St. Helens, London, E. C.

The Automatic Valve Grinding Machine Company, of Knoxville, Tenn., has been chartered with a capital of $20,000, by Alex. A. Scott, T. F. Hazen and others.

Herpel Bros., Reynoldsville, Pa., has recently built an addition 40 ft. x 80 ft., of brick, for general machine and foundry work. New machinery will soon be added.

The Third Vice-President, Veryl Preston, of the United States Steel Corporation, has resigned from the finance and executive committees and will at once go into other business.

The Helmwick Foundry Machine Company, Fairmount, W. Va., will rebuild and improve its foundry and blacksmith shop recently destroyed by fire. This company makes mine cars, castings, etc.

The American Bureau of Inspection and Tests has been awarded the contract for making the inspection and tests of the steel work for the large new freight house of the Baltimore & Ohio in Chicago.

The Giroux Consolidated Mines Company, 52 Broadway, New York, at a recent meeting authorized the buying of machinery and equipment for its 300-ton reduction plant at the Mexican mines of the company.

The Commercial Railway Equipment Company, of Portland, Me., has been incorporated in Maine, with a capital of $100,000, to make and sell all kinds of railroad equipment. M. W. Baldwin, President, and J. J. Hernan, Treasurer.

The Dominion Dump Car Company, of Ottawa, has been chartered with a capital of $2,000,000, to make cars and to buy and use certain car patents. Henry S. Hart, of Chicago, and James S. Smellie, of Ottawa, and others are incorporators.

The New Jersey Steel Company has been incorporated in New Jersey, with a capital of $1,250,000, to make and deal in steel and iron. Edgar E. M. Whiney of East Orange, N. J.; Horace S. Gould of New York, and others are incorporators.

The Water Works Department, Jackson, Tenn., will receive bids till Nov. 24 for one horizontal high-duty crank and fly wheel pumping engine, capacity to be 6,000,000 gallons in 24 hours, with auxiliaries. S. C. Lancaster, City Engineer.

The T. W. & C. B. Sheridan Company, New York, has been incorporated in New York with a capital of $180,000, to make machinery, with Theo. W. Sheridan, Sea Cliff, N. Y.; Chas. B. Sheridan, East Orange, N. J., and others as incorporators.

The Union Machine Company, local reports say, will build new shops in West Nashville, Tenn., to be located on the line of the Tennessee Central, including a machine shop 100 ft. x 180 ft., and a foundry about the same size. W. D. McRae is Manager.

Mr. Philip H. De Witt, Member American Society Civil Engineers, has resigned as an Assistant Engineer of the New York Central & Hudson River R. R., to accept the position of Consulting Engineer with G. B. Markle & Co., miners and shippers of coal, Jeddo, Pa.

The Commissioners of the District of Columbia have let contract for a 2,500,000 gallon pumping engine for the new Trumbull street pumping station at Washington, D. C., to the Holly Manufacturing Company, of Buffalo, N. Y., at its bid of $19,950, which was the lowest bid received.

In the Appellate Division of the Supreme Court at Providence, R. I., a decree has been entered giving permission to Lorin M. Cook and Willard C. Perkins, receivers of the American Tubing & Webbing Company, to sell the property of the company by public auction on Tuesday, Dec. 1.

Mr. Irving H. Reynolds will shortly retire from the Allis-Chalmers Company, and the duties of Chief Engineer will be assumed by the engineers in charge of the various departments, these engineers availing themselves of the advice of Mr. Edwin Reynolds, Consulting Engineer of the company.

The Lackawanna R. R. has established a freight agency in New York. Frank H. Pyke has been placed in charge, with offices at 82 Wall street. The objects of the agency are to build up and concentrate the eastbound freight traffic similar to the methods employed in the development of westbound tonnage.

The Westinghouse Air-Brake Company, of Pittsburg, has been incorporated in Pennsylvania with a capital of $11,000,000. The new company is a merger of the Westinghouse Air-Brake Company, organized in 1863, and the Electro-Magnetic Brake Company, chartered under the act of 1874.

The Baldwin & Rowland Switch & Signal Company, of New Haven, has been incorporated in Connecticut, with a capital of $125,000, to make, sell and lease switches and signals of all kinds for use on city railroads and steam railroads. Max Adler, N. W. Kendall and others are incorporators.

The Soule Rawhide Lined Dust Guard Company, Boston, Mass., has orders from the Pullman Car Company for 9,200 dust guards. The company has also made a shipment of 800 to the Louisville & Nashville, and miscellaneous orders to the Delaware & Hudson, American Car & Foundry Co., Boston Elevated, Lehigh Valley, and South Baltimore Car & Foundry Company.

The American Nut & Bolt Fastener Co., Pittsburg, Pa., is equipping with the Bartley fastener the following cars: Five hundred Chesapeake & Ohio, now being built by the Pressed Steel Car Co. at Pittsburg; 500 Chicago, Lake Shore & Eastern, at Western Steel Car & Foundry Co., Hegewisch, Ill.; 34 horse cars, Pennsylvania, at Erie Car Works, Erie, Pa.; and 50 Rodger ballast cars for the St. Joseph & Grand Island, at Detroit.

The Brackett Bridge Company, of Cincinnati, Ohio, has contracts for 12 bridges for the Chautauqua Traction Co., Jamestown, N. Y.; complete electric power plant for the Camden Interstate Ry. Co., Huntington, W. Va.; one 150 ft. bridge for the Walnut Hills Coal & Mining Co., in West Virginia; a 55 ft. 15-ton traveling crane for the Jamestown St. Ry. Co., and a large number of county bridges. The officers of the company are: President, F. J. P. Brackett; Vice-President and General Manager, Geo. A. Brackett.

In reply to newspaper rumors, Mr. J. W. Duntley, the president of the Chicago Pneumatic Tool Company, makes the following statement: The company has paid promptly all its interest and sinking fund charges on its bonded indebtedness. It has declared its dividends out of actual earnings, after writing off all expenses, fixed charges, and allowing liberally for depreciation of plants, etc. It has paid its dividends out of its own moneys. It does not owe a dollar of borrowed money. It has no floating indebtedness, except current monthly bills for material and supplies, which do not exceed $48,000, and these we are ready to pay promptly when due. The company has over $1,000,000 in quick assets over and above all current liabilities, including current bills, accrued interest, dividends, etc. Its net earnings for the past nine months are $513,224. Its present business, and the outlook for the future, is satisfactory in every way. Its European business is growing faster in proportion than the local business. The company is now selling its tools and machines in every civilized country in the world, and is no longer dependent on the American trade for its business. These are facts, and the company's record shows the payment of every obligation, no borrowed money, no current indebtedness, except its monthly bills, and a large surplus in quick assets. The regular annual statements will be made and published at the end of the year.

Iron and Steel.

The National Iron & Steel Works Company, of Mexico City, it is reported, is planning to build a rolling mill and make other improvements in Mexico City.

It is expected that the recent reductions made by the various steel companies on steel billets from $27 to $23, and on steel bars from $32 to $26 a ton, will result in increased business.

The Lorain Car Company, of Lorain, Ohio, organized with a capital of $200,000, will build its shops at Lorain, for which plans are ready, to make and repair cars for electric railroads. H. Lewis, of Cleveland, is interested.

The Carpenter Steel Company, of Reading, Pa., has been put into the hands of a receiver on the application of Richard P. Lydon, of New York, a creditor. Robert Jennings, of Jersey City, has been appointed the receiver.

A New Centrifugal Pump.

A centrifugal pump of new design and unprecedented capacity is designed to be exhibited at the St. Louis Exposition by Henry R. Worthington, of New York City. It is a departure from the usual centrifugal practice and is capable of delivering about 500 gallons of water per minute against a head of 250 lbs. per sq. in., and with high efficiency. This pump is of the type known as the multi-stage, turbine centrifugal and differs in a great many respects from other centrifugal pumps.

Acetylene Gas Works in France.

The Paris, Lyons and Mediterranean has erected a works at Bercy, near Paris, for producing the mixture of acetylene gas with Pintsch's carburetted gas, obtained from Boghead shale oil, used for lighting their cars. The mixture consists of 25 per cent. of acetylene gas and 75 per cent. of the oil gas, which can safely be compressed to 10 atmospheres, without risk of explosion. In order to produce the gas from the Boghead shale, there are three benches of seven retorts each, fired direct with coke. In each charge, 110 lbs. of shale oil yield 353 cu. ft. of gas in 1½ hours, and after depositing the tar the gas passes through condensers filled with oxide of iron and lime purifiers. The plant for the preparation of the acetylene gas is situated alongside the main gas-works, and contains three cylindrical generators, each 9.84 ft. high by 2.62 ft. in diameter, capable of producing 530 cu. ft. of gas per

hour. There is also a condenser, a scrubber, two purifiers, a meter and a gasometer. The generators are of the non-automatic type, and the calcium-carbide is placed by hand, a shovelful at a time, in the charging orifice, after having been broken up into lumps of a suitable size. The carbide falls into the water, and drops on to a grating, while the gas, which is at once evolved, rises to the upper part of the cylinder and passes out through an opening provided for it. The solid residue falls through the grating, and can be extracted from time to time by the manhole. The gas which enters the gasometer can then be passed to the meter-house for admixture with the oil gas. The admeasurement of the relative quantities of each gas is made by gearing together the two meters, so that a mixed gas is obtained in uniform proportions, and the gas in this form is stored in two gasometers, each having a capacity of 3,531 cu. ft. This gas has three times the illuminating power of the rich oil gas. The works are capable of producing about 5,000,000 cu. ft. of the mixed gases annually.

THE SCRAP HEAP.

Notes.

The winter time-table of the Lake Shore & Michigan Southern provides for a new through night train, each way, between Buffalo and Pittsburg, over the Pittsburg & Lake Erie; also for a new through day train from Buffalo to Chicago.

On the Long Island Railroad passengers having bicycles now receive brass checks instead of the card checks serially numbered, which have heretofore been in use. It is said that many owners of wheels have taken them away without surrendering their card checks.

Under orders passed by the last Legislature the Massachusetts Railroad Commissioners will soon hold hearings on the order requiring an investigation as to the hours of labor of railroad employees, and on the necessity for compelling railroads to equip box cars with safety rails on the roofs.

The Interurban Street Railway Company, which operates the Metropolitan and Third avenue surface systems in Manhattan Borough, as well as the Union Railway Company's lines in the Bronx, has filed an amended certificate of incorporation changing the name to the New York City Street Railway Company. This was done to avoid confusion due to the similarity of its name to the Interborough Railway Company, which operates the elevated and subway lines in New York.

Mr. Midgeley rounds up his discussion of private car abuses by suggesting that the railroads form among themselves a stock company to buy up all of the outside owned refrigerator cars, stock cars, and other special types, and have them operated in the interest of the railroad companies. If the present owners refuse to sell at a good price he suggests that the railroad companies proceed to build cars. Pending the consideration and settlement of this question Mr. Midgeley recommends that the railroads reduce the amounts which they pay for private cars; reducing the 1 cent rate to 7½ mills and the rate of 7½ mills to 6 mills.

The Railroad Commission of Louisiana has been permanently enjoined by Judge Niles, of the United States Court, from making rates on the Gulf & Ship Island R. R. The charter of this road was granted in 1882, and exempts the road from the supervision of the Commission. The Supreme Court, in a case a few months ago, decided that the Commission had no supervision over the road. The Gulf & Ship Island, ever since it was built, has claimed this exemption under its charter, and some time ago secured a temporary injunction preventing the Railroad Commission from interfering with its rates, which Judge Niles has now made permanent.

A New Claim Agency.

The Railway & Steamship Shippers' Traffic Association has been organized, with headquarters at Washington, D. C., and intends to have offices in the principal cities where there are general offices of railroad companies. The concern proposes to act as a shippers' claim agent; to handle freight claims, rate and classification adjustments, tracing of shipments, and car supply, and to furnish any service that shippers may want. R. E. Bunch is chairman.

No Trainmen's Examinations in England?

The New York elevated railroad has ordered a physical examination of the men with a view to weeding out. The men imagine there is more of pretext than principle in this action and a strike is threatened. If the company wanted to reduce the staff they could easily do so summarily. So we are forced to the conclusion that greater efficiency is the main object. It is a notion that might with advantage be copied by many English companies. We have neither examinations on duties nor examination of physical capabilities, and the result is a railroad servant whose mind is quite a blank on the most ordinary details regarding time of trains and such matters, and whose manners are susceptible of great improvement.—*Herapath's Journal (London).*

Type-Written Car-Records.

At the International Association of Car Accountants and Car Service Officers at Quebec last June, Mr. Beecham's method of transcribing train and interchange car reports by machine was described (see *Railroad Gazette*, July 3). In the time since that meeting, further developments have been made resulting in the adoption by a number of roads, among which are the Southern and the Illinois Central, of a new sized tag on which these records are transcribed. This tag is of the exact width of one movement of the typewriter roller. Its length has been increased to three inches instead of the one inch limit of the tag formerly used. By this means each record transcribed, with initial of car and number of same, also with date and mark indicating either loaded or empty movement, is accommodated on the one line, saving two shifts of the typewriter carriage. This reduction in lost motion in operating the machine has resulted in a marked increase in the average number of records transcribed per operator each day.—*Equipment Register.*

Physical Examinations of Motormen.

The recent threatened strike on the Manhattan (Elevated) Railway, New York City, appears to have been due to the strenuous way in which the men objected to the physical examination required by the railroad company. These examinations have to do not only with sight and hearing but also with respiration and heart action. The motormen now running the company's trains, were, until a few months ago, engineers of the steam locomotives, by which the trains were formerly moved, and the radical change in their work has, apparently, made the men abnormally nervous, not to say suspicious. The final settlement, silencing the talk about a strike, hinged on the integrity of the medical examiners and the frequency of re-examinations. The company now agrees in substance that men who have been examined and found normal shall not be re-examined for two years and six months from the date of their last examination, unless they show weakness; and where an employee is not satisfied with the doctor's decision, he may call in any reputable physician or specialist in New York City; if the two doctors do not agree, they are to select a third, and a decision of the majority of the three shall be final. The company will pay the cost of all examinations.

English Trade Union Tendencies.

At a late meeting of the Amalgamated Society of Railway Servants (British) the general secretary, Mr. Richard Bell, M. P., amongst other matters stated that in recent years the railroad companies had been paying further attention to the best methods of obtaining a greater carrying capacity of their trains and increased power in their locomotives. That by their efforts in this direction the 22 leading companies had effected a saving of 4,231,000 miles as compared with the same period in 1900; that the average train miles run per engine for the half year ending June was about 9,000. That fewer locomotives had been used and consequently the responsible labor of enginemen and firemen had been increased and therefore the hours should be reduced to some more equable standard, in his opinion a nine hours' day being the desirable maximum. Apparently these sentiments found favor with his audience for the following resolution was passed:

"That this congress views with alarm the enormously increased strain placed upon engine drivers, firemen, guards and others engaged in the manipulation of railroad traffic by the increased hauling power of the modern locomotive, and is of opinion that the time has arrived when a demand should be made for higher remuneration and reduced hours of labor to compensate those workmen for their increased responsibilities." A draft of an eight hours' bill for railroadmen was submitted. The congress was inclined to regard the measure as hardly wide enough in scope, but the General Secretary wisely cautioned the would-be amenders from overreaching at the first attempt.

Technical Instruction on British Railroads.

The Great Western Railway Company recently published details concerning a scheme whereby registered apprentices between 17 and 18 years of age in their employ at Swindon, where their works are situated, can obtain technical instruction. Candidates must have spent at least one year in the factory and must have regularly attended for at least one session in the preparatory group of evening classes at the technical school. The number of studentships will be limited to 30 at any time in groups as follows, for a three years' course: First year, 15 students; second year, 9 students; third year, 6 students.

For each year's course there will be a competitive examination, successful students passing on from one year's course to the next. Candidates must produce evidence of good conduct and attention to their work in the factory, and only those who attain a minimum qualification at the examinations will be successful. The course will consist of practical mathematics, practical mechanics, geometrical and machine drawing, heat, electricity, and chemistry. Each session will consist of 26 weeks, September to April. Wages will be paid to each student as if at the factory and their school fees also be settled by the company.

Private study in the evening is expected, and a recommendation is made that each student should endeavor to obtain a thorough knowledge of the few most important subjects rather than a smattering of a great number. Those distinguishing themselves will be allowed to spend part of their last year in the drawing office and chemical laboratory. The chief mechanical engineer will at all times have direction of arrangements. This is certainly a wise step on the part of the directors, and it is to be trusted that the innovation will meet with a full measure of success.

Similarly the General Manager of the Lancashire & Yorkshire Railway has announced that his directors have made arrangements with the authorities of Owens College, Manchester, to pay the fees of any of their clerical staff who attend the evening lectures on railroad transport at the college during the present session. A certain standard of proficiency will have to be shown by those availing themselves of the privilege if they wish to qualify for an extension of the same in the following sessions. Owens College has a good reputation among educational institutions.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular mettings of railroad associations and engineering societies see advertising page xvi.)

Canadian Society of Civil Engineers.

The next meeting of this Association will be held Dec. 10, at Montreal, Que. Discussion of the papers presented at the meeting Nov. 5 on "Sewage Disposal at Provincial Goal, Victoria, B. C.," by E. Mohan, and "Fire-proof Grain Storage Elevator for the Canadian Northern Railway, Port Arthur, Ont.," by R. M. Pratt, will be continued and finished, after which a new paper on "The Pressure of Grain in Deep Bins," by J. A. Jamieson, will be discussed.

PERSONAL.

—Mr. F. W. Tracy, at one time President of the Ohio & Mississippi, died at Springfield, Ill., Nov. 8, at the age of 69.

—Mr. Francis Ford, at one time Chief Engineer of the "Bee Line," died at his home in Cleveland, Ohio, on Nov. 1, at the age of 75.

—Mr. R. M. Kimber, Division Superintendent of the Chicago, Burlington & Quincy at Galesburg, Ill., died recently. He was 52 years old.

—Mr. L. Wooster, of Gloversville, N. Y., died Oct. 29, at the age of 92. He was a contractor and built parts of the New York Central & Hudson River, the Wabash and railroads in Vermont.

—Mr. Edward V. Skinner, Assistant Traffic Manager of the Canadian Pacific, was born in England, but was brought up at Charlestown, Mass. He now is 54 years old. Mr. Skinner entered railroad service in 1879 on the Erie in the passenger department. Two years later he went to the Pennsylvania, but soon returned and remained with the Erie until 1885. In that year he went to the West Shore, but soon left that place to take the General Eastern Agency of the Canadian Pacific at New York City. His title was General Eastern Agent; now he is made Assistant Traffic Manager.

—Mr. Benjamin A. Hegeman, for many years Traffic Manager of the Delaware, Lackawanna & Western, died at his home in North Plainfield, N. J., on Sunday, Nov. 1. He was born in New York City and began his railroad service on the "Lackawanna" as General Freight Agent, and continued in this position until 1884, when he was promoted to be Traffic Manager. Mr. Hegeman retired from railroad service about five years ago. He was a member of the Board of Managers of the Joint Traffic Association (1896-1898) and his portrait appeared in the *Railroad Gazette* May 15, 1896, page 333.

—Mr. John V. Goode, who for a number of years was General Superintendent of the Fort Worth & Denver City, died recently at Abbeyville, La. Mr. Goode was a Southerner, born at Louisa C. H., Virginia, in 1863. He began his railroad service at the age of ten, starting as a messenger and operator on the Chesapeake & Ohio, and subsequently was made Chief Train Despatcher of the Wabash. For a few years he was on the Missouri Pacific in a similar position, and in 1889 was made Superintendent on the Fort Worth & Denver City, and six years later was promoted to the General Superintendency.

—Mr. E. P. Broughton, for several years General Superintendent of the Chicago & Eastern Illinois, died suddenly in Colorado Springs, Colo., Nov. 7. He was born in Lancashire County, England, in 1837, and entered the service of the Buffalo & Lake Huron in 1857 as a telegraph operator: he was later on the Grand Trunk. In 1872 he went to the Chicago & Alton and remained with that road until 1879, when he resigned to go to the Chicago & Eastern Illinois as local agent at Chicago. In 1890 he was appointed General Agent there, and three years later he was promoted to the General Superintendency, from which position ill health compelled him to resign some time ago.

—Mr. L. R. Zollinger, who has been appointed Principal Assistant Engineer of the Pennsylvania Railroad Division of the Pennsylvania Railroad at Altoona, to succeed Mr. Johnston, is a graduate of Lehigh University. Mr. Zollinger's whole railroad service has been on the Pennsylvania, beginning in 1889 as a rodman in the Assistant Engineer's office at Harrisburg. In February, 1891, he was transferred to Altoona as a transitman, and the following June was appointed Assistant to the Assistant Engineer of the Philadelphia Division. For

three years (1895-1898) he was Assistant Supervisor, and for the four years following (1898-1902) he was Supervisor, two years on the Norristown, Schuylkill Division, and two years on the Philadelphia Division. In the latter year (1902) he was made Assistant to the Principal Assistant Engineer of the Pennsylvania Railroad Division at Altoona, and on the first of this month was promoted to be Principal Assistant Engineer of that division.

ELECTIONS AND APPOINTMENTS.

Addyston & Ohio River.—Thos. H. McGechin has been appointed Auditor, with headquarters at Addyston, Ohio, relieving D. P. Hopkins, Superintendent, to this extent.

Baltimore & Ohio Southwestern.—P. H. Reeves, hitherto General Foreman, has been appointed Master Mechanic, with headquarters at Chillicothe, Ohio, succeeding F. J. Smith.

Canadian Pacific.—Charles Murphy has been appointed Superintendent of District No. 2, with headquarters at Toronto, Ont., succeeding Jas. Manson, transferred. This district has been extended over the Toronto and Hamilton Terminals, of which F. G. Martyn has been appointed Assistant Superintendent, with headquarters at Toronto, succeeding D. R. Bell, transferred. W. J. Singleton has been appointed Superintendent of District No. 3, which consists of the Ottawa & Quebec Sections and Branches, with headquarters at Montreal, Que. F. M. Spaidal has been appointed Superintendent of District No. 2, which consists of the Montreal Terminals and Smith's Falls Section, with headquarters at Montreal, and E. Reynolds has been appointed Assistant Superintendent of the Quebec Section and Branches, with headquarters at Quebec.

W. J. Camp has been appointed Electrical Engineer, with headquarters at Montreal, Que.

Chicago & Eastern Illinois.—J. F. Russ has been appointed Superintendent, with headquarters at Danville, Ill., succeeding J. C. Muir, resigned. (See St. Louis, Memphis & Southeastern.)

Chicago, Cincinnati & Louisville.—C. L. Nichols has been appointed Superintendent, with headquarters at Richmond, Ind., succeeding R. R. Sutherland, resigned.

Chicago, Rock Island & Pacific.—W. E. Anderson, Master Mechanic, with headquarters at Goodland, Kan., has resigned.

Colorado & Southern.—W. E. McGraw has been appointed Superintendent of Terminals, with headquarters at Denver, Colo., succeeding S. H. Barnes, resigned.

Colorado Springs & Cripple Creek.—E. F. Draper, Secretary, has been elected Treasurer also.

Delaware & Hudson.—A. A. Heard, hitherto General Eastern Agent of the Lehigh Valley, has been appointed Assistant General Passenger Agent of the D. & H., with headquarters at Albany, N. Y.

Denver & Rio Grande.—C. H. Gregg has been appointed Superintendent of Dining Car Service, with headquarters at Denver, Colo., succeeding J. F. Lobdell.

Des Moines, Iowa Falls & Northern.—W. J. Souder has been appointed Superintendent, with headquarters at Iowa Falls, Iowa.

Duluth, Missabe & Northern.—W. G. Wallace has been appointed Master Mechanic, with headquarters at Proctor, Minn.

Fort Smith & Western.—J. J. Gibson has been appointed General Freight and Passenger Agent, with headquarters at Fort Smith, Ark.

Galveston, Harrisburg & San Antonio.—D. K. Colburn has been appointed Bridge Engineer, with headquarters at Houston, Texas.

Georgia.—W. S. Morris, hitherto Assistant Treasurer, has been appointed Treasurer, succeeding W. T. Richards, resigned.

Hawkinsville & Florida Southern.—The officers of this company are: President, B. M. Robinson; Vice-President, G. A. Speer, and Secretary, A. Boylston.

Houston & Texas Central.—W. L. Bisbee, hitherto Acting Superintendent at Houston, has been appointed Superintendent.

Illinois Central.—W. D. Watkins has been appointed Master Mechanic, with headquarters at Water Valley, Miss., succeeding J. F. Price, resigned.

Leavenworth, Kansas & Western.—J. H. Brinkerhoff, Superintendent, with headquarters at Leavenworth, Kan., has resigned. (See Union Pacific.)

Lehigh Valley.—See Delaware & Hudson above.

Nashville, Chattanooga & St. Louis.—J. A. Baldwin has been appointed Assistant Superintendent, with headquarters at Atlanta, Ga.

New York Central & Hudson River.—At a meeting of the Board of Directors held recently J. Stillman was elected a Director, succeeding E. V. W. Rossiter. Mr. Stillman was also elected a member of the Executive Committee.

New York, Texas & Mexican.—D. K. Colburn has been appointed Assistant to the President. (See Galveston, Harrisburg & San Antonio.)

Rio Grande Southern.—A. S. Meldrum has been appointed Superintendent, with headquarters at Ridgway, Colo.

St. Louis, Memphis & Southeastern.—J. C. Muir, hitherto Superintendent of the Chicago & Eastern Illinois, has been appointed General Superintendent of the St. L., M. & S. E., with headquarters at Cape Girardeau, Mo.

South Buffalo.—G. L. Reis has been elected Vice-President. Henry Wehrum, General Manager, with headquarters at Buffalo, N. Y., has resigned.

Tacoma & Eastern.—N. Johnson has been appointed Superintendent and N. Lawson, Assistant Superintendent, with headquarters at Tacoma, Wash.

Union Pacific.—J. H. Brinkerhoff, hitherto Superintendent of the Leavenworth, Kansas & Western, has been appointed Superintendent of the U. P., with headquarters at Denver, Colo.

Vermont State Railroad Commission.—G. T. Howard has been appointed railroad commissioner, succeeding Horace W. Bailey, resigned.

Waterloo & Cedar Falls Rapid Transit.—A. I. Woodring has been appointed Signal Engineer, with headquarters at Waterloo, Iowa, succeeding R. C. Galyean, resigned.

Wiscasset, Waterville & Farmington.—F. B. Hubbard, Superintendent, with headquarters at Waterville, Me., has resigned.

Wise Terminal.—D. R. Bishop has been appointed Superintendent, with headquarters at Glamorgan, Va., succeeding Charles Connor.

Yazoo & Mississippi Valley.—W. Dalton has been appointed Division Agent. This is a new office recently created and the duties are to instruct local agents and to inspect agencies.

LOCOMOTIVE BUILDING.

The Long Island is having 15 locomotives built at the Baldwin Works.

The Wrightsville & Tennille is having two locomotives built at the Baldwin Works.

The Vicksburg, Shreveport & Pacific is having five locomotives built at the Baldwin Works.

The Florida East Coast is having 10 locomotives built at the Schenectady Works of the American Locomotive Company.

The Toledo, St. Louis & Western is having two locomotives built at the Schenectady Works of the American Locomotive Company.

CAR BUILDING.

The Seaboard Air Line has ordered five passenger cars from Barney & Smith.

The American Car & Foundry Company has miscellaneous orders for 24 cars.

The Baltimore & Ohio is reported to be in the market for a number of refrigerator cars.

The Fort Smith & Western has ordered four cabooses from the American Car & Foundry Company.

The Mexican Central has leased 700 box, 50 stock, 200 coal and 100 flat cars from the Pullman Company.

The New Orleans & Northeastern has ordered 300 box cars from the Southern Car & Foundry Company.

The Chicago & Western Indiana has ordered 300 coal cars of 60,000 lbs. capacity from Haskell & Barker.

The St. Louis, Brownsville & Mexico has ordered 50 flat cars from the American Car & Foundry Company.

The Virginia & Southwestern has ordered three passenger coaches from the American Car & Foundry Company.

The Morton-Gregson Car Lines, Chicago, have ordered 30 refrigerator cars from the American Car & Foundry Company.

The Cherokee Construction Company is having 150 freights built at the Mt. Vernon Car Mfg. Company, Mt. Vernon, Ill.

BRIDGE BUILDING.

AKRON, OHIO.—Plans made for the building of a viaduct at Mill street call for a steel span 165 ft., with concrete walls, the total cost to be about $90,000, to be built jointly by the city and the railroads interested.

ALMONTE, ONT.—A new bridge is to be built to replace the present bridge of the Canadian Pacific over the Mississippi River at that point.

ATKINSON, KAN.—Shawnee County will have to spend about $100,000 for new bridges to repair the damage caused by floods.

ATLANTA, GA.—Permission has been given by the Council and the Board of Aldermen to the Southern Railway to excavate under Nelson street, on condition that the Southern build and maintain a viaduct from the eastern end of Nelson street bridge to Madison avenue.

The engineer in charge of the Government river and harbor work of this district will serve the Southern Railway with an order from the Secretary of War to build draws with not less than 80 ft. opening in its bridges over the Savannah River.

BATAVIA, N. Y.—The New York Central, local reports state, will build a footbridge over its tracks at Jackson street.

BAY CITY, MICH.—Bids are wanted Nov. 28 by John G. Buchanan, clerk of the Bay County road commission, for building a steel bridge over the Burger Creek.

BERLIN, ONT.—At the meeting of the County Council it was stated that about 20 bridges in the county would have to be replaced by steel structures.

BETHLEHEM, PA.—The Bethlehem Terminal & Bridge Company may be granted its charter next week to build a steel bridge 3,000 ft. long over the Lehigh River and Monocacy Creek.

BLOOMSBURG, PA.—The Danville & Bloomsburg Electric Railway Company has plans ready to build a bridge 125 ft. long over Fishing Creek; also to build an overhead trestle.

CANAL DOVER, OHIO.—The City Council has under consideration the building of a stone arch bridge on Factory street, at a cost of about $60,000.

CHATTANOOGA, TENN.—A viaduct may be built over the tracks of the Cincinnati Southern and the Western & Atlantic Railroads on McCallie avenue, at a cost of about $40,000.

CLEVELAND, OHIO.—The People's Street Railway has under consideration the building of a bridge to cost about $40,000.

DAYTON, OHIO.—The plans for the new Third street bridge call for a structure 798 ft. between abutments, and 62 ft. wide, to be built of concrete. Work must be commenced within 10 days from the time the contract is awarded.

DES MOINES, IOWA.—Bids for the East Sixth street bridge were opened Nov. 6, and that of the Des Moines Bridge & Iron Works for $48,440 has been accepted. The work is to begin Dec. 15, and be finished in one year. The bridge is to be 703 ft. long x 21 ft. wide between trusses, with 6 ft. sidewalks. The bids submitted were: King Bridge Co., Des Moines, $56,400; Horace E. Horton, Chicago, $52,800; Canton Bridge Co., Canton, Ohio, $60,500; Clinton Bridge & Iron Works, Clinton, Iowa, $50,000; N. M. Stark & Co., Des Moines, $53,825; John Gilligan, Falls City, Neb., $53,950; A. Y. Bayne & Co., Des Moines, $53,985; Minneapolis Steel & Machine Co., Minneapolis, Minn., $54,900; George E. King Bridge Co., Des Moines, $50,000; Milwaukee Bridge Co., Milwaukee, $50,000; W. S. Hewitt & Co., $51,000; Modern Steel Construction Co., Waukesha, Wis., $49,900; Des Moines Bridge & Iron Works, Des Moines, $48,440; Bellefontaine Bridge & Iron Works, $55,000; Midland Bridge Co., Kansas City, Mo., $52,000; Penn Bridge Co., Beaver Falls, Pa., $52,600; J. F. Griffith & Co., $51,900; Newcastle Bridge Co., $48,000. The Pan-American Bridge Company also filed a bid, which was rejected, as the company did not comply with the instructions. Bids for this bridge were rejected Sept. 22, and the city has saved about $18,000 over the prices of former bids, partly due to the reduced price of material. (Oct. 16, p. 749.)

IRWIN, PA.—The Pittsburg, McKeesport & Greensburg Electric Railway Company, it is reported, will build a 1,000 ft. viaduct over the Irwin meadows; also a 50-ft. viaduct over the Pennsylvania Railroad and a creek near Lorimer.

KANKAKEE, ILL.—The Council, it is reported, may soon build a steel concrete bridge over Kankakee River at Washington street.

LA CROSSE, WIS.—The City Council, local reports say, has directed the Chicago, Milwaukee & St. Paul to build a new viaduct over its tracks at Rose street.

LAWRENCEBURG, IND.—Plans and specifications for a bridge to be built over the Miami River near Elizabethton, at a cost of about $20,000, have been prepared by County Engineer Krug.

LONGMONT, COLO.—Bids may soon be asked by Costilla County for the building of a bridge 210 ft. long over Rio Grande River near Monte Vista.

MILWAUKEE, WIS.—Residents are agitating the question of a viaduct to be built at 27th street, towards the cost of which the Chicago, Milwaukee & St. Paul will be asked to pay $25,000. The Mayor favors the project.

NEW YORK, N. Y.—There were only two bids received Nov. 5, by Bridge Commissioner Lindenthal for the building of the superstructure of the Blackwell's Island bridge over the East River between Manhattan and Queens, that of the Pennsylvania Steel Company for $5,132,985, and Milliken Bros., of New York, $5,188,850. The former bid of the Pennsylvania Steel Company which was rejected Sept. 24, was for $5,255,514. The last bid of the Pennsylvania Steel Company has been accepted.

Of the $7,500,000 city bonds, for which bids are asked Nov. 19 by the Finance Department, a part of the proceeds amounting to $1,500,000 will be used for the new Manhattan bridge to be built over the East River between Manhattan and Brooklyn.

ORADELL, VA.—A bridge may soon be built at Oradell avenue, at a cost of about $20,000.

OTTAWA, ONT.—The city of Ottawa and County of Carleton have applied to the railroad committee of the Privy Council for an order directing the building of a bridge 150 ft. long over Rideau River at New Edinburg.

PAWNEE, OKLA. T.—Bids are wanted Nov. 19 by the Commissioners of Pawnee County for building five steel truss bridges in Pawnee County; also for the building of a combination wood and steel bridge over the Arkansas River at Cleveland. C. R. Adams, County Clerk.

RICHMOND, IND.—The Eastern Indiana Traction Company is making surveys for a number of bridges, to be built on the line of its road between Richmond and Fountain City.

The Columbus, Greensburg & Richmond Traction Company may rebuild the Doran street bridge at a cost of about $10,000.

RIEGELSVILLE, N. J.—The Delaware Bridge Company, local reports state, will at once rebuild the bridge at Riegelsville at a cost of about $25,000.

WHITTIER, N. H.—The Bartlett bridge may soon be replaced by a new steel structure.

WICHITA, KAN.—A bridge may be built by the county over Big Arkansas River, on Douglas street, at a cost of about $50,000.

WILKESBARRE, PA.—The Grand Jury recommends the building of a number of bridges at an aggregate cost of $17,000.

Other Structures.

CINCINNATI, OHIO.—The Cincinnati Inter-Terminal Company, local reports state, will build a freight house 70 ft. wide and about 800 ft. long.

DEPOT HARBOR, ONT.—The Canada Atlantic will build a new grain elevator at Depot Harbor, Georgian Bay, on the site of the new breakwater now building at that place, with a capacity of 1,250,000 bushels.

FORT DODGE, IOWA.—The Minneapolis & St. Louis, local reports state, has commenced work its new station, which is to be 47 ft. x 140 ft., three stories high, and cost about $35,000.

HYPOLITE, MEXICO.—The Mexican Central will build a new roundhouse, machine shop and turntable at this place.

LOUISVILLE, KY.—The Bourbon Stock Yards Company, of Louisville, Ky., it is reported, will build sheds 416 ft. x 725 ft., at a cost of about $100,000, to replace structures recently destroyed by fire.

MOUNT VERNON, OHIO.—The Cleveland, Akron & Columbus has plans ready for a new passenger station to cost about $10,000.

PERU, IND.—The Logansport & Wabash Traction Company is buying land for the purpose of building a passenger station.

PORTSMOUTH, OHIO.—The Chesapeake & Ohio passenger station and freight house at South Portsmouth, recently destroyed by fire, will be replaced by a combined brick station and freight house.

WALTHAM, MASS.—The Boston & Maine is preparing plans for a new station on its Central Massachusetts Division.

WINNIPEG, MAN.—The Crown Grain Elevator Co. is

building the largest storage elevator and grain cleaning plant in Manitoba at Winnipeg, at a cost of $150,000. The main building is to be 50 ft. x 70 ft. and 150 ft. high. The elevator is to have a storage capacity of 250,000 bushels. The company will also build tank storage bins with a capacity of 2,000,000 bushels, and an engine house 42 ft. x 60 ft. to contain a tandem engine with three boilers of 400 h.p. for operating the machinery. Steam grain shovels will be used and about 160 cars a day can be handled. Artesian wells are to be sunk to supply water. The contract for the buildings has been awarded to W. S. Cleveland, of Minneapolis, Minn.

YAZOO CITY, MISS.—The residents of this place have forwarded a petition to the Railroad Commission asking that the Yazoo & Mississippi Valley be compelled to build a passenger station in Yazoo City.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ARIZONA ROADS.—Press reports state that surveys have been made for a railroad from Tiger, Ariz., to Bradshaw City, 10 miles. Contracts will probably be let about Jan. 1, next. G. P. Harrington, Crown King, Ariz., is in charge of the work.

ARKANSAS SOUTHERN.—Location surveys for this railroad from Alexandria, La., to Winnfield, 50 miles, are practically completed, and rights of way are now being secured. Grading will be begun as soon as estimates on the cost of construction are prepared. G. W. Hunter, St. Louis, Mo., is President. (Aug. 7, p. 580.)

ATCHISON, TOPEKA & SANTA FE.—The newspapers say that contracts have been let by this company for building the first section of its proposed cut-off from Belin, N. Mex., to Texico, Texas. (Oct. 30, p. 786.)

ATLANTIC COAST LINE.—Press reports state that the extension from Punta Gorda, Fla., to Fort Myers, 28 miles, is practically completed, and that the line will be opened for traffic before the end of the year.

BALLSTON TERMINAL.—Maps have been filed by this company showing proposed extensions from Broadalbin, N. Y., southeast to Wayville, on the Boston & Maine, 30 miles, and from Milford, west through Galway to Broadalbin, 15 miles.

BIRMINGHAM & LINEVILLE.—Surveys are now being made for this railroad from Lineville, Ala., west to Pyrites, in Clay County, eight miles. Contracts for grading will be let in about two months. Wilson & Abber, Birmingham, Ala., are the engineers in charge of the surveys. (Oct. 30, p. 786.)

BLACK HILLS & WYOMING.—Articles of incorporation have been filed by this company in South Dakota. The line is to be 35 miles in length and will connect with the Fremont, Elkhorn & Missouri Valley at Rapid City, and with the Burlington & Missouri River at Mystic. C. D. Crouch, E. F. Hurlbutt and J. F. Gantz of Rapid City, S. Dak., are directors.

BUFFALO, ROCHESTER & PITTSBURG.—An officer writes that no change will be made for the present on the Middle Division of this road from Brockwayville, Pa., northeast to Ridgway. Work is now being done on 11 miles of second track between Ashford, N. Y., and S. & B. Junction. Grading is also in progress for a second track between Stanley and Big Run, eight miles. This latter work will be completed about July 1, 1904. (Oct. 30, p. 786.)

CACHE VALLEY.—It is reported that this company is building an extension northeast from Sedgwick, Ark., for a distance of 10 miles. It is stated that the line will be finished by the end of the year. E. W. Culver is President, and W. T. Blackford, Chief Engineer, both of Sedgwick, Ark.

CANADIAN PACIFIC.—Surveys are now being made for an extension from Guelph to Goderich, Ont., 70 miles. It is stated that grading will be begun early in the spring.

CHICAGO, BURLINGTON & QUINCY.—This company has opened its cut-off from Tracy, Iowa, east to Oskaloosa, 12 miles. The new line connects the Des Moines-Albia Division with the Burlington & Western Division. (Sept. 25, p. 698.)

COAHUILA & ZACATECAS.—It is stated that this company has practically completed its branch from Avalos, Mexico, west to San Pedro de Ocampo, 20 miles. Work will shortly be begun on a further extension to the Bonanza mining district, six miles. (April 3, p. 255.)

DEEPWATER.—The *Commercial and Financial Chronicle* has the following report from the Chief Engineer about the work on this line: "We have 55 miles from Robson to the Guyandotte River under contract, the construction of which is now in progress and will be completed as rapidly as possible. We have more than sufficient funds on deposit with the International Trust Company of Boston, to complete the 85 miles, and no mortgage of any kind has been executed, nor have we as yet placed any bonds or securities upon the market." The road is being built from Deepwater, W. Va., to the Blue Stone River in Mercer County, and has been completed to Robson, five miles. (Aug. 28, p. 624.)

DES MOINES & MISSOURI.—This company has been organized in Iowa for the purpose of building a railroad from Des Moines to Centerville, 80 miles. The road will open up large coal mines in Mahaska, Monroe and Appanoose Counties. Geo. G. Wright, Des Moines, is President.

FREEPORT & DIXON (ELECTRIC).—Articles of incorporation have been filed by this company in Illinois. It is proposed to build an electric railroad from Freeport south through South Freeport, Forreston and Polo, to Dixon, 35 miles. This new line will parallel the Illinois Central between these points. O. T. Smith, W. A. Hance, R. P. Eckert, F. A. Read and others, of Freeport, Ill., are incorporators.

GRAND RAPIDS & IONIA (ELECTRIC).—This company has been organized to build an electric railroad from Grand Rapids, Mich., east to Ionia, 30 miles. The proposed line will parallel the Grand Trunk between these points. E. M. Hopkins, Detroit, is President; J. T. Rich, Detroit, Vice-President; C. H. Pomeroy, Saginaw, Treasurer, and Frank Westcott, Vernon, Secretary.

GREAT NORTHERN.—It is reported that this company will soon begin work on a branch line from Wenatchee, Wash., up the north bank of the Columbia River to Chelan Falls, 30 miles.

KANAWHA & POCAHONTAS.—It is reported that a company by this name has been organized in West Virginia to build a railroad five miles long, from Paint Creek in Kanawha County, to Mossy Creek. Contract is reported let. G. H. Voegle, Mansfield, Ohio, is President, and C. F. Ackerman, General Manager.

KANSAS CITY & OLATHE (ELECTRIC).—Articles of incorporation have been filed by this company in Kansas. It is proposed to build an electric railroad from Rosedale, Kan., southwest to Olathe, 20 miles.

LEHIGH VALLEY.—The Montrose branch, which connects Tunkhannock, Pa., and Montrose, 28 miles, has been made standard gage.

LEWISTON & SOUTHWESTERN.—Articles of incorporation have been filed by this company in Idaho. It is proposed to build from Lewiston to Grangeville, 100 miles, with a branch to Nez Perces. F. W. Kettenbach, Lewiston, Idaho; Judson Spofford, Boise, Idaho, and others are incorporators.

LONG ISLAND.—Location surveys for two additional tracks are reported in progress between Far Rockaway, L. I., and Rockaway Beach, making the railroad four-track between these points. P. D. Ford, Jamaica, L. I., is the engineer in charge of the work.

LOUISVILLE & NASHVILLE.—This company has filed a notice with the Secretary of State of Alabama that it will shortly extend its line from Talladega, Ala., into Coosa County, a distance of 14 miles

MADISON & GREEN BAY.—This company is about to be organized in Wisconsin to build a railroad from Madison northeast to Green Bay, 150 miles. The proposed line was mentioned in our issue of Oct. 16, page 750, under the head of Wisconsin roads. H. C. McFall & Co., Cleveland, Ohio, are interested in the project.

MEMPHIS & GULF.—It is reported that a contract for building this line from Memphis, Tenn., south to Pensacola, about 300 miles, has been let to the Gulf States Construction Co. J. A. Lewis, Meridian, Miss., is President of the Construction Company. It is stated that work will be begun at once. Surveys for part of the line have been finished. (March 27, p. 240.)

MEXICAN & PACIFIC COAST LINE.—It is reported that application has been made to the Mexican Government by a syndicate of which David Moffatt, Denver, Colo., is the head, for a concession to build a railroad from Douglas, Ariz., through Cananea and the valley of the Yaqui River to Topolobampo, on the Pacific coast.

MEXICAN ROADS.—The Legislature of the State of Hidalgo has approved the concession recently granted to a syndicate for building a railroad from Pachuca, in the State of Hidalgo, northwest to Zimapan, 60 miles.

The Industrial Transportation Company, which recently obtained a concession from the Mexican Government to build a railroad from Atasta, in the State of Tabasco, northeast to Paso del Carrizal, will soon begin work.

MISSOURI & IOWA SOUTHERN.—The proposed route of this railroad is from Sedalia, Mo., north through Marshall to Miami, 55 miles. Connection will be made with the Missouri Pacific and the Missouri, Kansas & Texas at Sedalia, and with the Chicago & Alton at Marshall. A. L. Strang, Sedalia, is interested.

MONTANA R. R.—This company has completed its extension from Harlowton, Mont., to Lewiston, 62 miles, and the line will be opened for traffic in a few weeks. This company's road is now in operation between Lombard and Harlowton, 94 miles, and it connects with the Northern Pacific at Lombard. Robert Rantoul, Helena, Mont., is General Manager, and F. T. Robertson is Chief Engineer. (See Construction Supplement.)

MORGANTOWN & PITTSBURG.—A charter has been granted this company in West Virginia to build a railroad from Morgantown southwest to Fairmont, 20 miles. C. B. Dille and David Elkins, of Morgantown, and C. W. Fisher, of Fairmont, are incorporators.

NACOGDOCHES & NORTHEASTERN.—According to press reports, work will shortly be begun on this railroad from Nacogdoches, Texas, to Oil City. The road will run along the old roadbed of the Dallas & Red River Valley which was abandoned some time ago. The headquarters of the company are at Nacogdoches, Texas.

NATIONAL OF MEXICO.—This company has completed standard gaging its line from Corpus Christi, Texas, to the City of Mexico, 804 miles. The work was begun two years ago. E. N. Brown, Mexico City, is Chief Engineer. (April 17, p. 290.)

OLD RIVER & TRINITY.—A charter has been filed by this company in Texas. It is proposed to build from Moores Bluff, on the Trinity River, across Old River to Dayton, on the Texas & New Orleans, a distance of 10 miles. W. C. Huff, W. R. Miller, C. R. Cummings, J. W. Coleman and others, of Houston, Texas, are incorporators.

PHILADELPHIA & READING.—Rights of way have been secured and preliminary surveys have been finished for a cut-off between Cheltenham, Pa., and Neshaminy Falls, 10 miles.

PITTSBURG CONNECTING TERMINAL.—A charter has been granted this company in Pennsylvania, with power to build a terminal and connecting railroad in Pittsburg. W. C. Farnsworth, Harrisburg, Pa., is President.

SANTA ROSA & PETALUMA (ELECTRIC).—Articles of incorporation have been filed by this company in California. It is proposed to build an electric railroad from Santa Rosa southeast through Sebastopol and Forestville to Petaluma, 18 miles. F. A. Brush, A. D. Bowen, Thomas Archer, A. G. Sheath and others, of Santa Rosa, Cal., are interested.

STOCKTON SOUTHEASTERN.—An officer writes that contract for grading this railroad from Eldorado Springs, Mo., southeast to Stockton, 20 miles, will be let about Jan. 1. It is proposed to extend the line eventually to Springfield, Mo. Connection will be made with the Missouri, Kansas & Texas at Eldorado Springs. G. F. Wolf, Kansas City, is President. (Oct. 30, p. 786.)

TORONTO, HAMILTON & BRANTFORD.—Plans are reported completed for an extension of this line from Brantford, Ont., to Woodstock, 25 miles.

UTAH ROADS.—It is reported that the Utah Construction Company of Salt Lake City, has received a contract for building a narrow gage railroad from Crevasse, on the Rio Grande Western, in a southerly direction, 40 miles, to some large mines owned by the General Asphalt Company.

VANCOUVER ROADS.—Application will be made at the next session of Parliament for a concession to build a railroad from Spences Bridge, in a southeasterly direction through Nicola, Aspens Grove, Otter Flat, Granite Creek and Princeton to a point on the International boundary near Midway. Sinclair & Company, Vancouver, B. C., are said to be interested.

WHITE RIVER VALLEY.—The proposed route of this railroad, which was recently incorporated in Colorado, is from Rifle through Meeker, thence northeast through the Coal Creek and Mill Creek valleys to a point on the Yampa River, 90 miles, where connection will be made with the Denver, Northwestern & Pacific. E. G. Kindred, Denver, Colo., is interested. (Nov. 6, p. 804.)

WISCONSIN CENTRAL.—An officer writes that this company is building a spur from Park Falls, Wis., in a northeasterly direction for a distance of 10 miles. The road is for logging purposes only, and the work is being done by the company's forces. A logging road is also being built from Glidden, Wis., southwest four miles, to a sawmill owned by the company. (Nov. 6, p. 804).

YAZOO & MISSISSIPPI VALLEY.—Press reports state that this company is making surveys for a new line between Winter City, Miss., and Silver City, a distance of 40 miles.

GENERAL RAILROAD NEWS.

BALTIMORE & OHIO.—This company has sold to Kuhn, Loeb & Co., $10,000,000 of bonds, consisting of prior lien 3½'s, 1898; first mortgage 4's of 1898, and Southwestern Division first mortgage 3½'s of 1899. The proceeds are to be used to reimburse the company for expenditures on account of improvements and additions, as provided for in the reorganization plan.

BRADFORD, BORDELL & KINZUA.—The foreclosure sale of this road which runs from Bradford, Pa., to Kane, 41 miles, is announced for Dec. 1. D. H. Jack, Bradford, is the receiver.

CHICAGO, BURLINGTON & QUINCY.—At the annual meeting of the stockholders of this company, the action of the directors was approved arranging for the purchase of the Quincy bridge, the Burlington & Western Railroad and the Iowa & St. Paul. All of these have been operated by the Burlington for several years under lease and will now be consolidated with the parent company.

COLORADO & SOUTHERN.—Gross earnings of this company for the fiscal year ending June 30 were $6,142,989, an increase of $562,662. Operating expenses increased $630,237, leaving a decrease in net earnings of $67,575. The surplus for the year shows a decrease of $214,807. The report states that the heavy increase in cost of operation was due to higher wages and prices for materials, and to the severe congestion of freight traffic during the past year.

DETROIT, MONROE & TOLEDO SHORE LINE.—This company has filed a mortgage with the Union Trust Co. of Detroit for $3,000,000. First mortgage 4 per cent. gold bonds, due in 1933, will be issued, and the proceeds from the sale will be used to refund all outstanding obligations, and to take up the mortgage of the Toledo & Monroe R. R., which has been assumed by the present company.

ILLINOIS CENTRAL.—At the next meeting of the stockholders on Nov. 14, a vote will be taken on the proposition to purchase the properties, rights and franchises of the following lines: St. Louis & Ohio River, extending from Reevesville to Golconda; Christopher & Herrin, extending from Christopher in a southerly direction for a distance of five miles; the Mounds & Olive branch, extending from Mounds Station to Olive Branch in Illinois; the Groves & Sand Ridge, extending from a point in Perry County to Sand Ridge in Illinois; the Rantoul R. R., extending from Leroy, Ill., to the State line of Indiana, and the Illinois & Indiana, extending from Effingham to the State line of Indiana.

KNOXVILLE & OHIO.—This company has filed a mortgage with the North American Trust Company of New York for $3,000,000. The proceeds from the sale of the bonds will be used for paying a funded indebtedness of $2,000,000, and for necessary improvements on the main line and branch lines.

LAKE SHORE & MICHIGAN SOUTHERN.—The directors of this company have authorized an issue of $50,000,000 4 per cent. 25-year debentures. Of this issue, $25,000,000 will be used to take up the notes which were issued in January, 1903, for the acquisition of the stock of the Reading Company. The remaining bonds will be issued as circumstances may require to take up outstanding obligation and floating debt. The bills payable outstanding on Jan. 1, 1903, on account of properties acquired, aggregated $5,000,000. The Guarantee Trust Company of New York will probably be named as trustee to countersign the bonds.

NEW YORK & PORT CHESTER.—The Court of Appeals recently sustained the State Railroad Commission in its granting the certificate of public convenience under section 59 of the railroad law to this company. By sustaining the action of the Railroad Commission, the Court decides finally that the original charter of the Port Chester Company is valid. Having won in the courts and established itself from a legal standpoint, the Port Chester company's application must now be passed upon by the Railroad Committee of the Board of Aldermen, before the company can go ahead with its work.

NORTHERN CENTRAL.—At a meeting of the stockholders of this company on Nov. 9, it was voted to increase the capital stock from $12,000,000 to $20,000,000. This stock will be issued to retire outstanding bonds of the company and thus reduce the fixed charges.

PITTSBURG, VIRGINIA & CHARLESTON.—At the next meeting of the stockholders of this company on Dec. 31, a vote will be taken on the proposition to issue $6,000,000 first mortgage bonds to refund existing indebtedness.

SANDUSKY SOUTHWESTERN.—This company has filed a mortgage for $2,000,000 with the Cleveland Trust Company, Cleveland, Ohio, as trustee. The mortgage is given to secure a bond issue of 2,000 first mortgage 5 per cent. gold bonds, dated 1923. The proceeds from the sale of the bonds will be used for building from Wapakoneta, Ohio, to Kenton, and from Lima to Bellefontaine.

STOCKTON & BECKWITH PASS.—See Western Pacific.

WESTERN PACIFIC.—An agreement has been filed between this company and the Stockton & Beckwith Pass, transferring all the property and franchises of the latter company to the Western Pacific. In exchange for this the Western Pacific is to pay a sum of $93,000, and to deliver to the Stockton & Beckwith Pass 60,000 shares of its capital stock.